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A. D. Cotton.

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1910.

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Legislation in the West Indies for Controlling Diseases on Imported Plants.

Fungi Causing Diseases of Cultivated Plants in the West Indies.

Manurial Experiments with Cotton in the Leeward Islands.

Rainfall of Nevis and Antigua.

Courses of Reading and Examinations in Practical Agriculture.

Bancroft

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LEGISLATION IN THE WEST INDIES FOR THE CONTROL OF PESTS AND DISEASES OF IMPORTED PLANTS.

BY H. A. BALLOU, M.Sc., ENTOMOLOGIST ON THE STAFF OF THE IMPERIAL DEPARTMENT OF AGRICULTURE.

Previous to the establishment of the Imperial Department of Agriculture, several colonies had enacted legislation by means of which it was possible to prohibit the importation of any or all plants from a specified country, or countries, in which any special disease was known to exist, such as, for instance, from Ceylon, owing to coffee leaf disease.

The earliest of these laws seems to have been the Jamaica Seeds and Plants Importation Law, No. 4 of 1884 which, amended by No. 25 of 1891, is still in force. Proclamations which have been issued under these two laws provide for the fumigation of all plants imported into Jamaica at the present time.

In 1890, the Government of Trinidad passed a law, No. 8 of 1890, which prohibited the importation of diseased sugar-canes, and in 1894 another, No. 28 of 1894, which similarly provided for the prohibition of the importation of plants, seeds and beans, affected, or suspected to be affected, with disease. In 1898, the Trinidad Agricultural Society put forward suggestions (Society Paper No. 107) for a system of inspection of imported plants, with powers for the destruction of any such plants found to be affected with disease. Laws similar to those in Jamaica and Trinidad were in force in the islands of the Windward and

Leeward groups, making it possible to prohibit the importation of plants. The following list gives the numbers of these laws :—

Jamaica	No. 4 of 1884.
	No. 25 of 1891.
Trinidad and Tobago	No. 8 of 1890.
	No. 28 of 1894.
Windward Islands :	
Grenada	No. 14 of 1891.
St. Vincent	No. 19 of 1895.
St. Lucia	No. 5 of 1895.
Leeward Islands :	
Antigua	No. 4 of 1897.
St. Kitts-Nevis	No. 2 of 1897.
Montserrat	No. 3 of 1897.
Virgin Islands	No. 3 of 1897.
Dominica	No. 3 of 1898.

It will be seen that, previous to the organization of the Imperial Department of Agriculture in 1898, all the colonies except British Guiana and Barbados had laws calculated to prevent the introduction of diseases and pests of plants by prohibiting the importation of plants from certain places, but none of those laws provided for inspection, fumigation or disinfection of plants on arrival at their destination.

More recently, laws have been passed in all the colonies making provision for the introduction of plants into any island under conditions which as far as possible reduce the risk of introducing pests and diseases. Many of these laws are given in the following pages, with comments, and comparisons with the provisions of those of different places. Certain of these have appeared previously in the *West Indian Bulletin*, and are included among the references in the list given below.

When the Imperial Department of Agriculture was organized in 1898, one of the first of the important problems which presented itself for consideration was the development of a system of control of insect pests and fungoid diseases. With this object in view, an Entomologist and a Mycologist were appointed on the staff of the Department. In this connexion also, the Secretary of State for the Colonies addressed a despatch, dated October 3, 1899, to the Officers administering the Government in these islands, in which it was suggested that uniform laws should be made in the West Indies, British Guiana, Bermuda, the Bahamas and British Honduras.

This despatch indicated the danger of diseases being spread by means of plants imported into one colony from another, referred to the laws that had previously been passed for the purpose of prohibiting the importation of certain seeds, plants, etc., from countries where special diseases were known to exist, and pointed out that no system had been adopted in any of the West Indian colonies to check and, if possible, prevent the importation of diseased specimens. It was further announced that an Economic Entomologist would be appointed on the staff of the Imperial Department of Agriculture. The despatch, in addition to this, suggested that a system of inspection might be devised, under which all imported plants should

be inspected by an Officer of the Government, and that plants which were admitted after inspection should be recorded, the address of their destination being kept, in order that they might be inspected from time to time.

During 1900 and 1901, the Imperial Commissioner of Agriculture issued three circulars for the information of those colonies which were desirous of taking steps for the better control of imported plants. The first of these contained the despatch of the Secretary of State for the Colonies dated October 3, 1899, together with a letter from the Government Secretary of British Guiana, Society Paper 107 of the Trinidad Agricultural Society, and suggestions for a Plant Disease Ordinance. (*West Indian Bulletin*, Vol. I, pp. 314 and 323.) The second of these contained an extract from the Report of the Directors of the Royal Botanic Gardens, Ceylon, 1889, in regard to experiments in the fumigation of seeds and plants with hydrocyanic acid gas; an extract from the Report of the Government Entomolgist, Cape of Good Hope, 1899, import regulations regarding fruit trees, etc., and a memorandum by the Entomologist on the staff of the Department, with regard to certain insects likely to be introduced with imports of plants, fruit, etc. (*West Indian Bulletin*, Vol. I, pp. 457-62.) The third circular gave useful information as to the results of experiments in fumigating plants, etc., with hydrocyanic acid gas. A further circular was issued in July 1904, containing the Jamaica laws, the titles of several other laws then in force in the West Indies and directions for fumigating plants with hydrocyanic acid gas.

Following on the suggestions of the Secretary of State for the Colonies in the despatch of October 3, 1899, the Imperial Commissioner of Agriculture issued a circular letter, under date of August 3, 1900, in which the fumigation of imported plants with hydrocyanic acid gas was suggested as a means of treating imported plants for the destruction of insect pests. Another circular was issued in January 1901, in which particulars as to plant importations, including fruit and vegetables, into the several colonies were asked for. The returns which were supplied in response to this request furnished a basis on which suggestions for the treatment of imported plants were made by the Officers of the Department. The subject of plant diseases and importation of plants came up for discussion at the first, second and fourth Agricultural Conferences. The papers and discussions were published in the *West Indian Bulletin*. The following list of references includes the papers and discussions mentioned, and other articles which have appeared in the *West Indian Bulletin* in connexion with the subject.:—

West Indian Bulletin, Vol. I, p. 133. The Prevention of the Introduction of Fungoid and Insect Pests in the West Indies, by Wm. Fawcett. (Conference of 1899.)

West Indian Bulletin, Vol. I, p. 309. Legislation suggested for the Treatment of Insect and other Pests Affecting Economic Plants. (Conference of 1900 : Discussion.) With appendix giving laws in force in Jamaica (1884 and 1891), Trinidad and Tobago (1890 and 1894), with Suggestions for a Plant Disease Ordinance.

West Indian Bulletin, Vol. I, p. 457. Fumigation of Seeds and Plants, with Import regulations of Cape of Good Hope, and Memorandum by Mr. H. Maxwell-Lefroy on pests likely to be introduced with plants.

West Indian Bulletin, Vol. II, p. 318. Suggestions for Insect Control in the West Indies, by H. Maxwell-Lefroy.

West Indian Bulletin, Vol. II, p. 344. Treatment of Imported Plants at Jamaica.

West Indian Bulletin, Vol. III, p. 140. Suggestions for controlling the Importation of Insect Pests by H. Maxwell-Lefroy.

The *Agricultural News* has contained two articles under Insect Notes (Vol. III, pp. 74 and 138) on this subject, in which the necessity for regulations to prevent the importation of insect pests has been brought out, and plans for fumigating chambers and directions for the fumigation of plants etc., have been given.

Some of the most destructive pests and diseases known in present-day agriculture are those which have been transported from their native localities to other regions. Many of these have in all probability been carried on, or with, their food-plant or host-plant and have become established before their presence was known. Insect pests are likely to be much more destructive when transported to new localities, because they are often not controlled, as in their native environment, by natural enemies. The subject of preventing the introduction of pests and diseases, in connexion with the importation of plants, has been considered in most of those countries in which the agricultural industries are of great importance.

The West Indian Islands and the British Colonies in the American tropics depend almost entirely on agriculture for their welfare, and it would seem essential that everything should be done that can be done to ensure protection from infestation.

The present paper gives an account of the progress of legislation for the purpose of controlling plant importations, with copies of some of the earliest laws enacted, and an account of those at present in force which have a bearing on this subject.

These laws are compared and discussed, and the prominent features of each are mentioned.

In the following pages, the legislation is taken by islands and by colonies, and the closing paragraph presents a comparison between the legislation of the several governments, in regard to the control of imported plants.

In a subsequent paper, shortly to be published, it is proposed to give an account of the various methods of disinfection and fumigation, with directions for carrying them out under different circumstances, as well as a further discussion of the general subject of importation of insect pests and fungoid diseases, especially with reference to the laws at present in force or liable to be enacted in these colonies.

JAMAICA.

The laws in force in Jamaica for the control of insect pests and fungoid diseases on imported plants were used as the foundation on which legislation for the same purposes has since been enacted in many Colonies and Presidencies.

The text of the Jamaica Law No. 4 of 1884 is reproduced herewith, together with that of No. 25 of 1891. It will be seen that these two laws are to be taken and read as one, and that sections 1 and 2 of the Law 25 of 1891 are intended to make the provisions of section 1 of the previous Law (4 of 1884) more general and more comprehensive.

JAMAICA—LAW 4 of 1884.

The Seeds and Plants Importation Law, 1884.

[*31st October, 1884.*]

Whereas it is expedient to take precautions against the introduction into this Island of leaf and other kindred diseases in plants, and with that view to empower the Governor by Proclamation to prohibit the importation of seeds, plants or soil, either altogether, or from such country or countries, or except on such conditions, as he may see fit;

Be it enacted by the Governor, with the advice and consent of the Legislative Council of the Island of Jamaica, as follows:—

Power to Governor by proclamation to prohibit or restrict the importation of seeds or plants &c.

1.—It shall be lawful for the Governor, from time to time, by Proclamation to be published in the Jamaica *Gazette*, to prohibit the importation of seeds, plants, or any description of earth or soil. or any article packed therewith, that may have come either directly or or indirectly from any country that may be named in such Proclamation; and also in like manner to prescribe the conditions under which alone the importation of any of the articles aforesaid shall be permitted that may have come either directly or indirectly from any country named in such Proclamation, the importation from which is not absolutely prohibited; and any such Proclamation as aforesaid from time to time to revoke or vary.

Such prohibited articles to be deemed to be prohibited goods, and conditions to be deemed restrictions, under the Customs Laws.

2.—Any of the articles aforesaid coming as aforesaid from any country the importation from which is for the time being prohibited, and any of the articles aforesaid arriving as aforesaid from a country the importation from which is allowed upon conditions only, until and unless such conditions shall have been complied with to the satisfaction of the Principal Officer of Customs at the port of arrival, shall be deemed to be prohibited goods within the meaning of the Laws relating to Customs; and any such conditions aforesaid shall be deemed to be restrictions within the meaning aforesaid.

Onus probandi as to place from which articles are imported.

3.—So long as any Proclamation as aforesaid is in force, any of the articles aforesaid coming from parts beyond the sea may be deemed to have come from a place the importation from which is prohibited as aforesaid, and may be treated accordingly, unless the Importer satisfies the Principal Officer of Customs at the Port of arrival to the contrary.

JAMAICA—LAW 25 of 1891.

A Law in aid of the Seeds and Plants Importation Law 1884.

[*27th May 1891.*]

Preamble.

Whereas it is apprehended that leaf and other kindred diseases in plants may be introduced into the Island otherwise than by means of seeds, plants, earth or soil, or articles packed therewith, introduced into the Island from a Country named in a Proclamation of the Governor issued under Law 4 of 1884, and it is expedient accordingly to pass a Law in aid of the said Law 4 of 1884;

Be it enacted by the Governor and Legislative Council of Jamiaca, as follows:—

Power to prohibit the importation of any goods, packages coverings, &c.

1.—It shall be lawful for the Governor, in and by any Proclamation issued or to be issued under the Provisions of the said Law, to prohibit the importation from the Country named in such Proclamation of any particular goods, packages, coverings, or other articles or things, to be named in such Proclamation, which in his judgment are likely to be a means of introducing diseases in plants from the Country to which such Proclamation applies.

Prohibited packages, goods, &c., subject to Law 4 of 1884.

2.—Any goods, packages, coverings, articles or things, named under the Provisions of this Law in any such Proclamation shall be subject to all the Provisions of the said Law applicable to seeds, plants and other things, named in any such Proclamation under the Provisions of the said Law.

Law 4 of 1884 incorporated.

3.—This Law and Law 4 of 1884 shall be read and taken together as one Law.

JAMAICA.

GOVERNMENT NOTICES.

Colonial Secretary's Office.

No. 78.—2.

10th September, 1901.

It is hereby notified, for general information, that the Jamaica Agricultural Society having called the Governor's attention to the need for protecting this colony against the importation of diseased plants, His Excellency, on the recommendation of the Board of Agriculture, has deemed it advisable to issue the following proclamation, prohibiting the importation from the countries named, except at the Port of Kingston, of plants, etc., and their coverings, and providing for their being fumigated immediately on importation.

By Command,

SYDNEY OLIVIER,
Acting Colonial Secretary.

[L.S.]

A. W. L. HEMMING.

By His Excellency, SIR AUGUSTUS WILLIAM LAWSON HEMMING, Knight Grand Cross of the Most Distinguished Order of St. Michael and St. George, Captain-General and Governor-in-Chief in and over the Island of Jamaica and its Dependencies.

A PROCLAMATION.

By virtue of the power in me vested in that behalf by the first Section of Law 4 of 1884, 'The Seeds and Plants Importation Law, 1884,' and by the first and second sections of Law 25 of 1891, 'A Law in aid of the Seeds and Plants Importation Law, 1884;'

I do hereby prohibit, until further Proclamation, the importation into this Island, at any port except Kingston, of any plants, cuttings, buds or grafts or any goods, packages, articles, coverings or things in which the said plants, cuttings, buds or grafts may be packed or otherwise contained from any of the Countries hereinafter named, viz:—

The British Islands, Sweden, Norway, Denmark, Germany, Austria, Holland, Belgium, France, Spain, Portugal, Italy, Russia, Greece, Bulgaria, Servia, Roumania, Montenegro, Turkey, China, Japan, India and Burmah, Ceylon, Straits Settlements and Malay Peninsula, Sumatra, Java, Borneo, Philippine Islands, Persia, Arabia, Africa (any part), Madagascar, Mauritius, Réunion, Canada, United States, West Indies, Mexico, British Honduras, Honduras, Guatemala, Nicaragua, San Salvador, Costa Rica, Columbia, Venezuela, Guiana, Ecuador, Peru, Brazil, Paraguay, Uruguay, Argentine Republic, Chili, Bolivia, Fiji, Sandwich Islands, and other Polynesian Islands, Australia (any part), Tasmania and New Zealand.

And I do hereby accordingly revoke the Proclamation issued by Sir Henry Arthur Blake and dated the sixth day of September, 1895, under which orange plants, cuttings buds, or grafts might be imported at other ports besides Kingston.

And I do hereby under the sections of Law quoted above further proclaim that immediately on the importation into this Island of any plants, cuttings, buds or grafts, or of any goods packages, coverings or things in which such plants, cuttings, buds or grafts may be packed or contained, they shall be subjected to a thorough process of fumigation, to be hereafter decided and approved by me in Privy Council for the purpose of completely destroying all animal or vegetable parasites which may have been imported on or along with the said plants, cuttings, buds or grafts.

And I do hereby order that this my proclamation shall come into force on the First Day of October, now next ensuing.

Given under my hand and the Broad Seal of this Island, at King's House, this Seventh Day of September, in the first year of His Majesty's Reign, Annoque Domini 1901.

By Command,

SYDNEY OLIVIER,
Acting Colonial Secretary.

A. W. L. HEMMING.

[L.S.]

By His Excellency Sir Augustus William Lawson Hemming, Knight Grand Cross of the Most Distinguished Order of Saint Michael and Saint George, Captain-General and Governor-in-Chief in and over the island of Jamaica and its Dependencies.

A PROCLAMATION.

Whereas by a Proclamation dated the Seventh day of September, and made under the authority of section 1 of Law 4 of 1884 (The Seeds and Plants Importation Law, 1884) it was among other things proclaimed and ordered that immediately on the importation into this island of any plants, cuttings, buds or grafts, and of any goods, packages, coverings or things in which such plants, cuttings, buddings or grafts, hereinafter referred to under the general term of 'proclaimed articles' might be packed, they shall be subjected to a thorough process of fumigation to be hereafter decided upon ;

And whereas the Governor in Privy Council has since decided upon adopting the process of fumigation hereinafter set forth for the purpose of completely destroying all animal or vegetable parasites which may have been imported on or along with the said proclaimed article ;

Now, therefore, I do hereby proclaim and order that the importation into this Island of all 'proclaimed articles' shall be subjected to the following conditions :—

All proclaimed articles shall be fumigated, and the work of fumigation shall be carried out by the staff of the Government Laboratory—a fumigatory box shall be employed for small operations, and a fumigatory chamber at the wharf for large. For ordinary purposes the dose of cyanide to be vaporised shall be one ounce for every 300 feet of cubic space and the exposure shall be one hour. For the more delicate plants half the above dose of cyanide shall be used and the exposure shall be half an hour only. Plants in Wardian cases shall be fumigated while still in the case. The Island and Agricultural Chemist shall be the authority to decide in any question connected with the fumigation of proclaimed articles which involves the exercise of any discretion.

Given under my hand and the Broad Seal of this Island, at King's House, this Fifteenth Day of October, in the First year of His Majesty's Reign, Annoque Domino 1901.

By Command,

SYDNEY OLIVIER,
Colonial Secretary.

7th January, 1902.

The Governor directs the publication, for general information, of the instructions issued for the guidance of Officers of the Government Laboratory and the Kingston Customs in regard to the manner in which imported plants, seeds, etc., shall be dealt with

By Command,
SYDNEY OLIVIER,
Colonial Secretary.

Instructions for the Guidance of Officers of the Government Laboratory and Kingston Customs in regard to the manner in which imported plants, cuttings, etc., and their coverings shall be dealt with.

Immediately on the landing of any plants, cuttings or other articles specified in the Governor's Proclamation of the 7th September, 1901, published in the Government Notice No. 278, of the 10th of that month in the Jamaice *Gazette*, they shall be taken charge of by the Customs Officer who will give the Wharfinger or other party concerned, a receipt therefor, showing the time and date of delivery.

The Customs Officer shall at once notify the Government Chemist in writing, of the articles to be fumigated, stating the the approximate dimensions thereof and obtain his instructions as to the time at, and place to, which they are to be forwarded for fumigation.

The Customs Officer will then forward the articles accordingly in charge of a Customs Escort who will remain in attendance during the process of fumigation and afford, or provide, such assistance and labour as the Government Chemist or his officer in charge may require.

Immediately on receipt of the articles the Government Chemist (or his assistant) shall cause them to be fumigated in the manner and under the conditions prescribed by the Governor in Privy Council.

So soon as this shall have been done and a memorandum showing the time of receipt and delivery furnished to the Customs Escort, the articles shall be taken charge of by the Escort and conveyed to the King's Warehouse or other place, as arranged by the Landing Waiter.

The greatest care must be taken by the Officer in charge of the King's Warehouse to keep plants, cuttings, &c., alive and in good condition.

All expenses of removing the articles to the Government Laboratory, and thence to the King's Warehouse, with any expenses necessarily incurred in keeping the articles in good condition shall be met by the Importer, all such amounts being brought to account as King's Warehouse fees as provided by the Customs Regulations on the subject.

Plants, cuttings, &c., should not be forwarded to the King's Warehouse in cases where importers defray expenses of removal, labour, &c., (if any) at once, and at the same time arrange with the Customs Officer to take delivery of the articles immediately after fumigation. This provision will refer more particularly to the plants, &c., brought by passengers and imported through the parcel post, &c.

Officers of Customs and of the Laboratory are required to exercise strict economy in arranging for the transport of the plants &c. and other expenses, so that the charge to the Importers may be as small as possible.

BRITISH GUIANA

The British Guiana Ordinance No. 21 of 1903 provides that the Governor-in-Council may prohibit or restrict the importation of plants etc. from any place. The proclamation under the Ordinance dated November 6, 1903, prohibits the importation of all cacao plants and cacao seeds, except cured cacao, from Surinam.

A further proclamation, dated March 8, 1909, deals with imported sugar-cane plants or cuttings. The Law (No. 21, 1903) and both proclamations are reproduced herewith.

In section 2, part 1, of No. 21—1903, power is given to prohibit the importation, and in section 2, part 2, to prescribe the conditions under which plants might be admitted. The proclamation of November 6, 1903, prohibits, absolutely, the importation of cacao from Surinam, except cured cacao. In the case of the proclamation of March 8, 1909, however, the second part of section 2 of 21—1903 is made use of; that is, conditions are prescribed under which certain plants, all sugar-canes, or cuttings thereof, are admitted.

These conditions are, briefly, inspection by Government Botanist, with power to destroy if the plants are found to be infested with any pest or disease. If permission is given for the plants to be removed, the cane cuttings must be planted apart from general cultivation and must be subject to inspection at any time for twelve months, and if any disease or pest is found, different from any known in the colony, they may be destroyed.

BRITISH GUIANA—ORDINANCE NO. 21 OF 1903.

An Ordinance to prevent the introduction into this Colony of Diseases of Plants.

Be it enacted by the Governor of British Guiana, with the advice and consent of the Court of Policy thereof, as follows :—

Short title.

1. This Ordinance may be cited as the Importation of Plant Diseases Prevention Ordinance, 1903.

Governor-in-Council may prohibit or restrict importation of plants, etc., from any place.

2.—(1) It shall be lawful for the Governor-in-Council on the recommendation of the Board of Agriculture, by Proclamation to be published in the *Gazette* to prohibit the importation of any seeds, plants, or any description of earth or soil, or any article packed therewith, or any package, covering or thing that may have come directly or indirectly from any country or place named in such Proclamation, which, in his opinion, are likely to be a means of introducing any plant disease from such country or place.

(2) In like manner the Governor-in-Council may prescribe the conditions under which alone the importation of any of the articles aforesaid shall be permitted that may have come directly or indirectly from any country named in such Proclamation.

(3) The Governor-in-Council may from time to time vary or revoke any such Proclamation

3. Any of the articles aforesaid coming as aforesaid from any country or place the importation from which is for the time prohibited, and any of the articles aforesaid arriving as aforesaid from a country or place the importation from which is permitted upon certain condition only, until and unless such conditions shall have been complied with to the satisfaction of the Comptroller of Customs shall be deemed to be prohibited goods within the meaning of the Customs Ordinance, 1884, and any such conditions as aforesaid shall be deemed to be restrictions within the meaning of the said Ordinance.

Articles coming from a place from which importation prohibited or restricted to be deemed prohibited or restricted goods under Customs Ordinance.

4. So long as any Proclamation as aforesaid is in force, any of the articles aforesaid coming from parts beyond the sea may be deemed to have come from a place the importation from which is prohibited as aforesaid, and may be treated accordingly, unless the importer satisfies the Comptroller of Customs to the contrary.

Burden of proof that goods not prohibited or restricted thrown on importer.

PROCLAMATION.

J. A. SWETTENHAM,
Governor.

[L.S.]

By His Excellency Sir James Alexander Swettenham, Knight Commander of the Most Distinguished Order of St. Michael and St. George, Governor and Commander-in-Chief in and over the Colony of British Guiana, Vice-Admiral of the same. &c., &c., &c.

Whereas it is enacted by section 2 of the Importation of Plant Diseases Prevention Ordinance, 1903, that it shall be lawful for the Governor-in-Council, on the recommendation of the Board of Agriculture, to prohibit the importation of any seeds or plants which are likely to be a means of introduction into the colony any plant disease ;

And whereas the Board of Agriculture have recommended that the importation of all cacao plants and cacao seeds other than cured cacao from Suriname should be prohibited in order to guard against the introduction into this Colony of the disease known as 'Witch Broom' due to the fungus *Exoascus Theobromae* ;

I do hereby proclaim and make known that on and after the date of this Proclamation the importation into this Colony of cacao plants and cacao seeds other than cured cacao from Suriname is prohibited in accordance with the terms of section 2 of the Importation of Plant Diseases Prevention Ordinance, 1903.

Given under my hand and the Public Seal of the Colony, at the Guiana Public Buildings, Georgetown, Demerara, this Sixth day of November 1903, and in the Third year of His Majesty's Reign.

GOD SAVE THE KING.

By His Excellency's Command,

N. DARNELL DAVIS,
Acting Government Secretary.

PROCLAMATION.

BRITISH GUIANA.

F. M. HODGSON,
Governor.

By His Excellency Sir Frederick Mitchell Hodgson, Knight Commander of the Most Distinguished Order of Saint Michael and Saint George, Governor and Commander-in-Chief in and over the Colony of British Guiana, Vice-Admiral of the same. &c. &c. &c.

Whereas it is enacted by section 2 of the Importation of Plant Diseases Prevention Ordinance, 1903, that it shall be lawful for the Governor-in-Council, on the recommendation of the Board of Agriculture, to prohibit the importation of any seeds, plants, or any description of earth or soil, or any article packed therewith, which are likely to be a means of introducing into the Colony any plant disease and to permit their importation under certain prescribed conditions, and whereas the Board of Agriculture have recommended that the importation of all sugar-canes and cuttings thereof from Java, Australia, Fiji, Brazil, and the West Indian Islands, shall, owing to the prevalence of insect pests, fungoid and other diseases, be subject to the following conditions :—

(1) Sugar-canes or cuttings thereof from Java, Australia, Fiji, Brazil, and the West Indian Islands shall not be permitted to be imported in any description of earth or soil.

(2) All sugar-canes or cuttings thereof from the above-mentioned places to be inspected by the Government Botanist before being removed from the wharf or stelling at which they are landed and not to be removed from that place unless permitted by the Government Botanist in writing.

(3) If, on such inspection, the sugar-cane or cuttings thereof be found to be not free from pests or diseases of any sort already known to occur in the Colony the sugar-canes or cuttings to be treated as the Government Botanist may direct before removal from the wharf. If they are found to be infected with any pest or disease not commonly known in this Colony the sugar-canes or cuttings to be destroyed under the supervision of the Government Botanist or an officer of the Department of Science and Agriculture delegated for that purpose.

(4) If their removal is authorised by the Government Botanist, the sugar-canes or cuttings thereof to be planted in a nursery apart from the general cultivation and separate from other varieties of canes, and to be subject from time to time during twelve months from the date of importation to inspection by the Government Botanist or by an Officer of the Department of Science and Agriculture deputed by the Director for that purpose. If the canes are found at any inspection to be suffering from any pests or diseases already known in the Colony they shall be treated as may be directed by the Government Botanist, and if suffering from any pests or diseases not commonly known in the Colony they shall be rooted out and destroyed under the immediate supervision of the inspecting Officer

I do hereby proclaim and make known that on and after the date of this proclamation the importation into the Colony of sugar-canes or cuttings thereof from Java, Australia, Fiji, Brazil and the West Indian Islands shall be only under the abovementioned conditions in accordance with the terms of section 2 of the Importation of Plant Diseases Prevention Ordinance, 1903

Given under my Hand and the Public Seal of the Colony, at the Guiana Public Buildings, Georgetown, Demerara, this 8th day of March, 1909, and in the Ninth year of His Majesty's Reign.

GOD SAVE THE KING.

By His Excellency's Command,

CHARLES T. COX,
Government Secretary.

TRINIDAD AND TOBAGO.

An Ordinance passed in 1890 (No. 8 of 1890), entitled 'An Ordinance to prevent the introduction of Diseased Sugar-canes into the Colony', gives power to the Governor by proclamation to prohibit the importation of any sugar-canes grown in certain specified places in which sugar-cane diseases are known to exist. This was dated May 12, 1890.

Ordinance 28, 1894, which is given herewith, seems to have been passed to prevent introduction of coffee diseases, but it also provides for the total prohibition of plant importations.

An Ordinance to make provision for prohibiting the importation into the Colony of plants, seeds, berries and other articles affected or suspected to be affected with disease.

F. NAPIER BROOME,
[L.S.] Governor.

[8th September, 1894.]

Whereas it is apprehended that leaf and other kindred diseases in plants may be introduced into the Colony by means of plants, seeds, berries, earth, packages and otherwise; Preamble

And whereas it is expedient to protect the plantations in this Colony against such diseases:

Be it enacted by the Governor of Trinidad and Tobago with the advice and consent of the Legislative Council thereof as follows :—

1. This Ordinance may be cited for all purposes as "The Plant Protection Ordinance, 1894." Short title.

2 The introduction into the Colony of Coffee plants and uncured berries from Ceylon, Mauritius, Reunion, Fiji, Southern India, Sumatra, Java, Natal, or from such other places as may be included in any Proclamation under this Ordinance, is strictly prohibited. Prohibition of importation from certain places.

Power of Governor by Proclamation to prohibit importation of plants.

3. The Governor may from time to time with the advice of the Executive Council, by Proclamation to be published in the *Royal Gazette*, prohibit the importation into the Colony of any plants, seeds, berries, earth, soil, or any particular class of goods, packages, coverings, or other articles or things to be named and specified in such Proclamation which there shall be reason to believe to be affected with any disease, or which may be brought from any place outside the limits of the Colony where any such disease may exist or be suspected to exist, or which may be likely to be the means of communicating diseases to plants in this Colony.

Production of *Royal Gazette* evidence.

4. The production of a copy of the *Royal Gazette* containing a copy of such Proclamation shall be sufficient proof of the terms of such Proclamation and the publishing thereof.

Proclamation conclusive evidence as to statements therein.

5. A Proclamation issued and published under the provisions of this Ordinance shall be conclusive evidence in all Courts of Justice and elsewhere of the several matters and things therein set forth and contained.

Penalty.

6. Any person contravening the provisions of section 2 or of any Proclamation issued and published under the authority of this Ordinance shall be guilty of an offence against this Ordinance, and on summary conviction before a Stipendiary Justice of the Peace shall forfeit and pay any sum not exceeding Fifty Pounds sterling.

Power to seize prohibited imports.

7. Every article or thing imported into this Colony in contravention of this Ordinance or of any Proclamation under this Ordinance may be seized by any Officer of Customs or by any Commissioned or Non-commissioned Officer of Police or Police Constable, and shall be forfeited to Her Majesty, and may be destroyed or otherwise dealt with as the Governor may direct.

Procedure

8. Penalties under this Ordinance may be recovered before any Stipendiary Justice of the Peace, and the procedure for the recovery thereof shall be according to the Ordinance No. 5 of 1868, entitled 'An Ordinance respecting the Summary Administration of Justice,' or according to any Ordinance which may hereafter be passed regulating the Summary Administration of Justice.

Passed in Council this Twenty-seventh day of August, in the year of Our Lord one thousand eight hundred and ninety-four.

CHAS. J. ROOKS,
Acting Clerk of the Council.

Proclamation No. 10 of 1905 under this Ordinance was replaced by No. 13 of 1905, which is given herewith.

A PROCLAMATION.

Whereas by section 3 of the Plant Protection Ordinance 1894 (No. 28-1894) power is given to the Governor with the advice of the Executive Council to prohibit by proclamation the importation into this Colony of plants, seeds, berries, earth, soil or other articles or things which there shall be reason to believe to be affected with any disease or which may be brought from any place without the Colony where any such disease may exist or be suspected to exist.

And whereas it is expedient to prohibit, with certain exceptions, the importation into this Colony of cacao plants or portions of such plants or cacao beans from the mainland of South America.

Now, therefore, I, Henry Moore Jackson, Governor as aforesaid, with the advice of my Executive Council, do hereby prohibit the importation into this Colony from any part of the mainland of South America of cacao plants or portions thereof and of cacao beans except cured cacao beans from Venezuela and Colombia, and also fresh cacao beans and pods from the said countries provided that such latter beans and pods have been imported from a place free from disease and that they shall be carefully disinfected before distribution in this Colony.

Given under my hand and the Seal of the Colony at Government House in the Town of Port-of-Spain, this 15th day of April 1905.

By His Excellency's Command,

(Sgd.) WM. GORDON,
Acting Colonial Secretary.

Ordinance No. 126 is very similar to No. 28—1894. No. 127 provides for dealing with plant diseases and pests, and is very similar to Ordinance No. 20—1902 which is entitled 'An Ordinance to prevent the dissemination and to provide for the eradication of diseases affecting vegetation'. There is nothing in this Ordinance which provides for any control of imported plants which might be the means of introducing pests or diseases.

Ordinance No. 4—1907 refers to both No. 126 and No. 127, and provides that the Governor may by proclamation prescribe the conditions under which plants may be imported. This does not establish any system of fumigation such as that in Jamaica, nor any inspection such as that of British Guiana, but makes it possible to provide for either or both by proclamation.

BARBADOS.

The regulation and control of insect pests and fungoid diseases in Barbados is based on section 3 of the Trade (Amendment) Act, 1905 (1905—12), dated May 1, 1905, entitled *An Act to amend the Trade Act 1891 (1891—60)*, as follows:—

Be it enacted by the Governor, Council, and Assembly of this Island, and by the authority of the same, as follows:—

1. This Act may be cited as the Trade (Amendment) Act, 1905. Short title.

. . . . . .

3. (1) The Governor-in-Executive Committee may by order prescribe the conditions under which alone the importation of any seeds, plants or berries, or any description of earth or soil, or any article packed therewith, or any package, covering or thing that may have come directly or indirectly from any country or place named in such order, which, in the opinion of the Governor-in-Executive Committee are likely to be a means of introducing any plant disease from such country or place shall be permitted. Governor-in-Executive Committee may prohibit or restrict importation of plants etc., from any place.

Articles coming from a place from which importation prohibited to be deemed prohibited goods under Trade Act 1890.

(2) Any of the articles aforesaid arriving as aforesaid from a country or place the importation from which is permitted upon condition only, until and unless such conditions shall have been complied with to the satisfaction of the Comptroller of Customs, shall be deemed to be prohibited goods within the meaning of sections 48 and 49 of the Principal Act.

Burden of proof that goods not prohibited or restricted thrown on importer.

(3) So long as any order as aforesaid is in force any of the articles aforesaid coming from parts beyond the sea may be deemed to have come from a place the importation from which is permitted upon condition only, and may be treated accordingly, unless the importer satisfies the Comptroller of Customs to the contrary.

Construction of Act.

4. This Act shall be read and construed together with the Trade Act, 1891.

Read three times and passed the General Assembly the fifteenth day of November one thousand nine hundred and four.

F. J. CLARKE,
Speaker.

Read three times and passed the Legislative Council with amendments the twenty-first day of February one thousand nine hundred and five.

GEORGE C. PILE,
President.

Amended by the Legislative Council and amendments agreed to by the House of Assembly the twenty-fifth day of April one thousand nine hundred and five.

F. J. CLARKE,
Speaker.

I assent

G. T. CARTER,
Governor.
1st May, 1905.

The following order dated May 13, 1909, prescribes the conditions under which plants may be imported into Barbados.

Made by the Governor in-Executive Committee under section 49 of the Trade Act, 1891 (1891—60), as amended by the Trade (Amendment) Act, 1900 (1900—3), and under section 3 of the Trade (Amendment) Act, 1905 (1905—12), prohibiting the importation of seed-cotton, etc, etc., and prescribing conditions under which plants, etc., may be imported.

1. Seed-cotton shall not be imported or brought into this Colony from any country.

2. Cotton seed shall not be imported or brought into this Colony from the U.S. America, Cuba, Porto Rico, Mexico, or Guatemala, except under a license from the Governor-in-Executive Committee permitting any quantity, not exceeding 500 lb., to be imported at any one time, on the condition that such quantity is properly fumigated with carbon bisulphide before shipment, and that it will be fumigated or disinfected, or both, at the discretion of the Superintendent of Agriculture, or his Assistant, on its arrival in this Colony.

3. Cotton seed, from which oil is to be extracted, shal not be imported or brought into this Colony, except under the following conditions :—

(*a*) Such seed shall be fumigated either at the Government fumigatorium or in a building licensed for that purpose by the Governor-in-Executive Committee. Such seed shall be conveyed by the importer, immediately after it has been landed, to the Government fumigatorium or to the licensed building, under the supervision of an officer of the Local Department of Agriculture, who shall be immediately notified thereof by the Comptroller of Customs, and the fumigation shall be done at the expense of the importer in the presence, and to the satisfaction, of the Superintendent of Agriculture or his assistant, or :

(*b*) Such seed may be fumigated on board any ship conveying the seed, or in any building, licensed for the purpose, by means of sulphur dioxide gas generated and applied by means of a Clayton disinfector or similar apparatus at the expense of the importer and to the satisfaction of the Superintendent of Agriculture or his assistant, or :

(*c*) In lieu of fumigation, the bags or packages containing such seed, shall be marked, before being landed, with a red cross one foot in length, and shall be stored in a building licensed by the Governor-in-Executive Committee, which shall be distinct and separate from any building in which seed to be used for planting is stored. Such seed shall be conveyed to the licensed building at the expense of the importer immediately on being landed, under the supervision of an officer of the Local Department of Agriculture who shall be immediately notified thereof by the Comptroller of Customs.

(*d*) All bags or packages which have contained cotton seed stored in any building licensed by the Governor-in-Executive Committee, or any other article taken into such building shall, immediately on removal from such building, be placed in a steam oven and there kept at a temperature of not less than 212° F. for fifteen minutes, or placed in briskly boiling water and kept therein for a period of not less than fifteen minutes.

(*e*) The Superintendent of Agriculture, or his assistant, shall have power, at any time during any week day between the hours of 7 a.m. and 4 p.m., to visit and inspect any building licensed for the purpose of storing seed, which is not to be fumigated.

4. All plants, cuttings, buds, grafts, bulbs, roots, seeds, and also fruit and vegetables intended for propagation and not for consumption as food, imported into this Colony from any country, together with the packages, boxes, wrappers, soil, or anything whatsoever in which they are imported, shall be delivered by the importer to the Comptroller or other Officer of Customs, or the Colonial Postmaster or other Officer of the Post Office in order that they may be fumigated or disinfected or both fumigated and disinfected. Where, however, in the opinion of the Superintendent of Agriculture, or his assistant, fumigation or disinfection or both fumigation and disinfection, is not sufficient to destroy any insect pest or fungoid disease on any plant, cutting, bud, graft, bulb, root, seed, fruit and vegetable, or other article sent him for fumiga-

tion, he shall cause such article to be destroyed. In the case of the importation of any plant or part thereof, which in the opinion of the Superintendent of Agriculture should be grown apart from other plants of a similar description, he shall, if he think fit, require such plant, or part thereof, to be so cultivated, and such plant or plants shall be subject from time to time during twelve months from the date of importation, to inspection by himself or one of his assistants, and if any such plant is at any time found on inspection to be suffering from any pest or disease already known in the Colony, it shall be treated as directed by the Superintendent of Agriculture, and if suffering from any pests or disease not commonly known in the Colony, it shall be rooted out and destroyed, under the immediate supervision of the Superintendent of Agriculture or his assistant.

5. Immediately on the landing of the imported articles or other things mentioned in the preceding paragraph, other than those imported through the Post Office, they shall be taken charge of by the Comptroller of Customs or other Officer of Customs who shall give the party a receipt showing the time and date of delivery. Where they are imported through the Post Office, they shall be taken charge of by the Colonial Postmaster or other Officer of the Post Office, who shall also give the party a receipt showing the time and date of delivery.

6. All expenses of removing the articles or things mentioned in paragraph 4 to the place of fumigation or disinfection and thence to the Customs warehouse or General Post Office, and any expense necessarily incurred in keeping the articles in good condition, or in destroying any articles when they are so ordered by the Superintendent of Agriculture shall be met by the importer, who shall pay all such amounts to the Comptroller of Customs or to the Colonial Postmaster as the case may be.

7. The expenses mentioned in paragraphs 3 and 6 may be recovered in a summary manner before any Police Magistrate.

8. This order shall not apply to any of the abovementioned articles when imported by or for the Imperial Commissioner of Agriculture for the West Indies for scientific purposes, provided that the Imperial Commissioner of Agriculture for the West Indies so notifies the Comptroller of Customs or the Colonial Postmaster.

9. The order made by the Governor-in-Executive Committee on the eighteenth day of March 1909, under section 49 of the Trade Act, 1891 (1891—60) as amended by the Trade (Amendment) Act, 1900 (1900—3) and under section 3 of the Trade (Amendment) Act, 1905 (1905—12) is hereby revoked.

Made by the Governor-in-Executive Committee on the thirteenth day of May, 1909.

EDWD. T. GRANNUM,
Colonial Secretary, Acting.

NOTE:—Any person, who contravenes any of the provisions of the above Order is under section 49 of the Trade Act, 1891 (1891—60), liable to a penalty not exceeding £100 sterling.

This Order, it will be seen, prohibits the importation of seed-cotton, regulates the importation of cotton seed for planting and for oil-making, and prescribes the conditions under which plants may be imported. It provides for fumigation and disinfection and for the destruction of plants infested by any pest or disease which, in the opinion of the Superintendent of Agriculture, would not be killed by the ordinary processes of fumigation or disinfection. It also gives the Superintendent of Agriculture power to direct, if he think fit, that plants must be grown apart for a period of twelve months, during which time they must be inspected by him or his assistant, and at the end of that period they may be destroyed.

The Order gives the Agricultural Superintendent no discretion in respect of admitting plants without treatment; all imported plants must be treated, except plants imported by the Imperial Commissioner of Agriculture for scientific purposes.

THE WINDWARD ISLANDS.

GRENADA.

The Grenada Ordinance, No. 14 of 1891, which was repealed in 1897, provided that it should be lawful for the Governor from time to time to prohibit the importation of plants by Proclamation from any country or place named in the Proclamation which were likely to be a means of introducing diseases in plants; also to prescribe the conditions under which alone plants, etc., the importation of which is not absolutely prohibited, that may have come directly or indirectly from such place or country, may be admitted.

This Ordinance was repealed, because it was considered that section 79 of the Customs Ordinance was sufficient for the object in view.

This section is as follows:—

> 79. The Governor-in-Council may at any time by notice in the *Gazette* absolutely prohibit the importation into this Colony of any goods or articles of any kind whatsoever, and may by subsequent notice revoke such prohibition, either wholly or in part; and any ship bringing such goods into the Colony after such notice shall, subject to an appeal to the Governor-in-Council, be liable to forfeiture, and the goods shall be forfeited, and the importer or any person keeping or concealing the goods shall be liable to a penalty not exceeding one hundred pounds.

The following Order with respect to the importation of cacao was issued on March 21, 1902:—

> Under the authority of section 79 of the 'Customs Ordinance 1894' the Governor-in-Council is pleased to absolutely prohibit the importation into this colony from any country or place in South America, lying to the East or South of the Isthmus of Panama, of any pod, seed, or plants of Cocoa, or of any part or portion whatsoever of a cocoa tree.

Ordinance No. 17 of 1900, dated November 27, 1900, is entitled 'An Ordinance to prevent the introduction and to provide for the eradication of diseases affecting vegetation, and for other purposes.'

This Ordinance is the same in its provisions with regard to insects and diseases as the Trinidad Ordinance No. 20, 1903. It makes no reference to imported plants as a source of disease of plants, and is calculated more to deal with pests and diseases already established in the island than to prevent the introduction of others.

No. 7 of 1906, entitled 'An Ordinance to prevent the introduction into this Colony of Diseases of Plants,' is dated June 1, 1906.

GRENADA.

An Ordinance to prevent the introduction into this Colony of Diseases of Plants.

I Assent.
R. B. LLEWELYN,
Governor.
1st June, 1906.

[*1st June, 1906.*]

Be it enacted by the Governor with the advice and consent of the Legislative Council of Grenada as follows :—

Interpretation of terms.

1. In this Ordinance the expressions hereinafter mentioned shall have the meanings assigned respectively to them as follows :—

(*a*) 'Plants' includes growing plants, cuttings, buds and grafts, bulbs, roots, seeds and berries, and also fruit, and vegetables intended for propagation and not for consumption as food.

(*b*) 'Packages' includes boxes, coverings, wrappers, soil or anything whatsoever in which plants are imported.

(*c*) 'Port of Entry' means the port of St. George and any other port or place in this Colony appointed by the Governor for the importation of plants.

(*d*) 'Treasurer' includes every Officer of Customs.

(*e*) 'Agricultural authority' includes every person acting in the aid or under the direction of the Agricultural authority.

(*f*) 'Imported' means brought into this Colony by any channel whatsoever, including the 'Parcels Post.

(*g*) 'Importer' includes the Owner and his agents and servants.

Appointment of Agricultural authority.

2. The Governor may from time to time appoint some person to be the Agricultural authority under this Ordinance.

Governor-in-Council may by Proclamation prohibit importation of any plants, &c

3. (1) The Governor-in-Council may by Proclamation to be published in the *Gazette*, absolutely prohibit the importation, directly or indirectly from any country or place named in such Proclamation of any plants or any earth or soil, or any article packed therewith, or any packages, or other articles or thing which, in the opinion of the Governor-in-Council, are or is likely to be a means of introducing any

plant disease from such country or place. Any Proclamation issued hereunder shall remain in force for such time as may be mentioned in that or any subsequent Proclamation.

Consequences of importing prohibited plants &c.

(2) Any of the articles aforesaid, the importation of which into this Colony has been prohibited by any Proclamation as aforesaid, shall upon importation into this Colony be forthwith seized and forfeited to His Majesty, and the importer shall be guilty of an offence against this Ordinance.

When burden of proof thrown on importer of plants &c.

(3) So long as any such Proclamation is in force, any of the articles aforesaid coming from parts beyond the seas may be deemed to have come from a place the importation from which is prohibited as aforesaid, and may be treated accordingly, unless the importer satisfies the Treasurer to the contrary.

Fumigating and disinfecting apparatus.

4. Suitable apparatus for the fumigation or disinfection of plants shall be provided by the Government for use at the Port of St. George's and also at any other Port of Entry which may be appointed by the Governor for the importation of plants; and such apparatus hereinafter called 'the Fumigatorium' shall be under the care, control and management of the Agricultural authority.

All imported plants to be fumigated or disinfected.

5. (1) Hereafter, no plants whatsoever nor the packages thereof shall be allowed to be imported into this Colony, except under the conditions herein prescribed.

(2) No imported plants nor the packages thereof shall be landed in this Colony elsewhere than at a Port of Entry.

Procedure upon importation.

(3) All imported plants and the packages of the same imported into this Colony shall, upon their arrival be delivered up by the importer to the Treasurer for conveyance to the Fumigatorium there to be dealt with by the Agricultural authority; and the Treasurer shall thereupon give to the importer a receipt showing the time and date of such delivery

(4) Any person who imports any plants or packages as aforesaid contrary to the provisions of this section and all such articles so imported may be forthwith seized and forfeited to His Majesty.

Process of fumigation or disinfection.

6. The process of fumigation or disinfection or both shall be (subject to any Rules or Regulations made by the Governor-in-Council) carried out in such manner and under such conditions as the Agricultural authority may consider adequate for the destruction of any insect or vegetable pests which may possibly be on such plants; and no liability shall attach to the Government or to the Agricultural authority in respect of any damage occasioned by such fumigation or disinfection.

Removal of plants after fumigation or disinfection.

7. All plants and packages shall be returned by the Agricultural authority to the Treasurer as soon as practicable after fumigation or disinfection and shall be removed by the importer within forty-eight hours thereafter and failing the removal of the same within such time as aforesaid the Treasurer shall be at liberty to order their destruction.

Expenses of removal &c., may be recovered from importer.

8. The expenses of removing plants and other articles to and from the Fumigatorium, and of their fumigation or disinfection shall be defrayed by the Government, but the Government may recover from the importer these and any other expenses necessarily incurred in keeping the plants in good condition.

Power for Agricultural authority to inspect plants after delivery to importer.

9. The Agricultural authority may direct the importer, who in such case is hereby required to comply with such direction, to keep him informed as to the disposal of any plants after fumigation or disinfection, and may visit and examine them at any time if necessary.

Seizures to be notified in *Gazette*.

10. The seizure and forfeiture of all articles seized under any of the above provisions shall be notified in the *Gazette* so soon as practicable after the seizure; and any such articles so forfeited may be destroyed or otherwise disposed of as the Governor may direct.

Power for Treasurer to search for, seize and remove plants illegally imported.

11. It shall be lawful for the Treasurer and for any person acting for him under his authority, to enter any building, place or premises and to search for any plants or other articles which shall have been imported into this Colony in contravention of this Ordinance and which he has reason to suppose are in or on such building, place or premises, and for the purpose of such search to break open if necessary any door, chest, box, package or parcel and to seize such plants or other articles as aforesaid and to remove or secure the same in such way or place and in such manner as he deems most advisable.

Rules and Regulations.

12. The Governor-in-Council shall have power to make Rules and Regulations for more effectually carrying out the provisions and intentions of this Ordinance.

Penalty for offences under this law.

13. Any person who is guilty of an offence against this Ordinance or against any rule or Regulation made hereunder shall on conviction be liable to a penalty not exceeding the sum of Twenty Pounds for every offence.

Procedure in prosecutions.

14. All proceedings under this Ordinance against offenders shall be taken in the name of the Treasurer; and the mode of procedure shall be according to any law in force for the time being regulating proceedings before Magistrates.

Short title.

15. This Ordinance may be cited as 'The Plant Protection Ordinance, 1906'.

Passed the Legislative Council this twenty-third day of May in the year of our Lord one thousand nine hundred and six.

T. T. DYER,
Clerk of Councils.

This Ordinance is a good example of the modern law giving power to prohibit or restrict the importation of plants and providing (sec. 5) for the fumigation or disinfection of all imported plants. It allows (sec. 6) latitude to the agricultural authority in prescribing the exact treatment in each case, but does not permit the discretion of this officer to be used to exempt plants from fumigation.

ST. VINCENT.

The Plant Protection Ordinance 1895 (No. 19 of 1895) provided for total prohibition of any or all plants from any or all places, and for the seizure of any goods, packages, etc., etc., which it seemed reasonable to the Treasurer to suspect may be liable to convey diseases to plants. This was repealed by No. 5 of 1905, which in turn was repealed by No. 9 of 1906,

entitled 'An Ordinance to prevent the introduction into this Colony of diseases of plants', and dated August 2, 1906.

This law in all its provisions is like the Grenada Law (7—1906) just quoted.

The following notice was issued in 1906, and appeared in the St. Vincent *Gazette*, No. 33 of that year:—

The Governor-in-Council under the authority of section 5 of 'The Importation of Plant Diseases Prevention Ordinance 1906' has this 17th day of November, 1906 been pleased to absolutely prohibit the importation into this Colony, directly or indirectly, from any of the countries or places named in the subjoined Schedule the articles appearing opposite thereto.

SCHEDULE

From Ceylon, Natal, South India, Mauritius, and the Straits Settlements. Of all plants, seeds, berries, and any earth, soil, or vegetable matter used for packing or covering the same.

From South America. Of all cacao plants or trees and parts or portions of such plants or trees and any earth, soil, or vegetable matter used for packing or covering the same.

From the Colony of Trinidad and Tobago. Of any suckers, roots, fruit or any other portions of a banana-plant and any earth, soil, or vegetable matter used for packing or covering the same.

ST. LUCIA.

An Ordinance to prevent the introduction into this Colony of Diseases of Plants.

[No. 12 of January 22, 1910.]

Be it enacted by the Governor with the advice and consent of the Legislative Council of Saint Lucia, as follows:—

1. This Ordinance may be cited as the Plants Protection Ordinance, 1910. Short title.

2. In this Ordinance the expressions following shall have the meanings hereby respectively assigned to them, that is to say:— Interpretation of terms.

(*a*) 'Agricultural authority' means the Agricultural Superintendent and includes any person acting on his behalf by his direction.

(*b*) 'Disinfection' includes 'fumigation.'

(*c*) 'Imported' means brought into this Colony by any channel whatsoever.

(*d*) 'Importer' includes the owner and consignee and their agents and servants.

(*e*) 'Packages' includes boxes, coverings, wrappers, earth, soil or anything whatsoever in which plants are imported.

(*f*) 'Plants' includes growing plants, cuttings, buds grafts, bulbs, roots, seeds, and berries, and also fruit and vegetables intended for propagation and not for consumption as food.

(*g*) 'Treasurer' includes every Officer of Customs and for the purpose of dealing with the importation of plants and packages through the Post Office, includes the Post Master and any Official of the Post Office acting on his behalf by his direction or those of the Governor.

Importation of plants prohibited by Proclamation

3. (1) The Governor-in-Council may by Proclamation to be published in the *Gazette* absolutely or conditionally prohibit the importation directly or indirectly from any country or place named in such Proclamation of any plants or any earth or soil, or any article packed therewith or any packages or other articles or things which in the opinion of the Governor-in-Council are or is likely to be a means of introducing any plant disease into this Colony.

(2) Any Proclamation issued hereunder or under the Plant Protection Ordinance 1895, shall remain in force for such time as may be mentioned therein or in any subsequent Proclamation hereunder, and may be varied or revoked by the like authority.

(3) Any such plants, packages, earth, soil, articles or things imported into this Colony may be deemed to be a prohibited importation and may be treated accordingly, unless the Importer satisfies the Treasurer to the contrary.

Imported plants.

4. No plants whatsoever nor the packages thereof shall be imported into this Colony except under the following conditions :—

To be landed at port of Entry.

(1) All such plants and packages shall be landed at the Port of Castries, except when permission has been obtained under section five hereof to land the same at any other place.

And delivered up for disinfection.

(2) All such plants and packages shall be delivered up by the Importer to the Treasurer who shall cause them to be conveyed to the place of disinfection there to be dealt with by the Agricultural Authority, and the Treasurer may also for such purpose take charge of any such plants and packages immediately on their arrival in the Colony and prior to the delivery thereof to the Importer.

Receipt to be given.

(3) Upon such delivery the Treasurer shall give to the Importer a receipt showing the time and date of such delivery.

Permission to land plants elsewhere than at Castries.

5. The Governor may by permission in writing

(1) allow any Importer to land any plants and packages at any other place than the Port of Castries to be specified in such permission on being satisfied that the special permission of the Treasurer where necessary under the Customs Ordinance, 1888, has been obtained, and

(2) allow the importation of plants for scientific purposes without their being subject to disinfection on the application of the Imperial Commissioner of Agriculture or of the Agricultural Authority.

6. Suitable apparatus for the disinfection of plants shall be provided by the Government at the Port of Castries; and such apparatus shall be under the care of the Agricultural Authority. Disinfecting apparatus.

7. (1) The process of disinfection shall be carried out in such manner and under such conditions as the Agricultural Authority may consider adequate for destruction of any vegetable or insect pests which may possibly be on or amongst such plants or packages subject to any regulations made hereunder by the Governor-in-Council. Process of disinfection.

(2) No liability shall attach to the Government or to the Agricultural Authority in respect of any damage occasioned by such disinfection.

8. All plants and packages shall be removed from the place of disinfection by the Importer within twenty-four hours after he has been required by the Agricultural Authority to remove the same, and failing such removal the Agricultural Authority shall be at liberty to order the destruction of such plants and packages or to deal otherwise with them at his discretion. Removal of plants after disinfection.

9. The expenses of removal to and from the place of disinfection shall be borne by the Importer, and the Government may recover from the Importer such expenses as well as any expenses necessarily incurred in keeping the plants in good condition. Provided always that if the importation exceeds in bulk twenty cubic feet or in weight half a ton, then the Importer shall also bear the expenses of disinfection. Provided also that if plants are landed at any place other than the Port of Castries by special permission of the Governor then the Importer shall in addition pay all the expenses of disinfection including the transport of apparatus and the attendance of the Agricultural Authority and shall provide any labour necessary to carry out such disinfection. Expenses of removal, &c.

10. The Agricultural Authority may require the Importer to keep him informed as to the disposal of any plants after disinfection and may visit and examine them at any time, if necessary. Inspection of plants after removal.

11. (1) Where in the opinion of the Agricultural Authority disinfection is not sufficient to destroy any insect pest or fungoid disease on any plant sent him for disinfection, he shall cause such plant to be destroyed.

(2) Where in the opinion of the Agricultural Authority any imported plant or part thereof should be grown apart from other plants of a similar description, he shall, if he think fit, require such plant or part thereof to be so grown and shall, from time to time during twelve months from the date of the importation of such plant, subject the same to inspection by himself or as he shall direct, and if any such plant is at any time found on inspection to be suffering from any pest or disease already known in the Colony it shall be treated as directed by the Agricultural Authority and if suffering from any pest or disease not already known in the Colony it may be destroyed under the immediate supervision of the Agricultural Authority.

12. All plants, packages or other articles imported into this Colony contrary to the provisions of this Ordinance or of any Proclamation issued hereunder, or under the Plant Seizure of plants.

Protection Ordinance, 1895, may be seized and forfeited, and may be destroyed or otherwise dealt with as the Governor may direct.

Powers of search for plants illegally imported.

13. It shall be lawful for the Treasurer or for any person acting under his authority if he shall suspect that any plants packages or other articles have been imported contrary to the provisions of this Ordinance or to any Proclamation issued hereunder, or under the Plant Protection Ordinance, 1895, to enter any building, place or premises, and to search for any such plants, packages or articles, and for the purpose of such search to break open, if neccessary, any exterior or interior door, or any chest, box or other receptacle, and to seize such plants, packages or other articles as aforesaid, and to remove or secure the same in such way or place and in such manner as he deems advisable.

Penalties.

14. (1) Every person who shall do or omit to do anything which is by this Ordinance, or by any Regulation made hereunder, or by any Proclamation made hereunder, or under the Plant Protection Ordinance, 1895, forbidden or required to be done, or shall assault, resist, hinder, prevent or obstruct any person acting under and by the authority of this Ordinance, or of any Proclamation made hereunder, or under the Plant Protection Ordinance, 1895, shall be guilty of an offence against this Ordinance and shall on conviction be liable to a penalty not exceeding twenty pounds.

Procedure.

(2) All proceedings under this Ordinance against offenders shall be taken in the name of the Treasurer, and the mode of procedure shall be according to the provisions of any Ordinance for the time being regulating proceedings before Magistrates.

Power to make Regulations.

15. The Governor-in-Council may make Regulations for the better carrying out of all or any of the provisions of this Ordinance.

Repeal.

16. The Plant Protection Ordinance, 1895, is hereby repealed.

The present law (No. 12, 1910, January 22) follows closely on the Grenada (7--1906) and St. Vincent (9 1906) Ordinances already considered, and it replaces the previous law No. 5 of 1895.

The earlier law (5 -1895) provided for total prohibition of the importation of plants suspected of disease. A proclamation issued by the Administrator, under date of February 2, 1907, provided for the fumigation of imported plants, under the direction of the agricultural authority, before they could be admitted to the colony.

The latest law is the first of these Ordinances to employ the term disinfection as a general term including the application of both insecticides and fungicides, and perhaps more than one of each. The kind of treatment, if any, is left to the discretion of the agricultural authority and, on the whole, the Ordinance seems to be very thorough and complete.

THE LEEWARD ISLANDS.

Each Presidency of the Leeward Islands, with the exception of the Virgin Islands, has enacted legislation to provide for the fumigation of imported plants immediately on their being landed at the port of entry.

The following are the numbers and dates of the Ordinances providing for the fumigation of imported plants now in force :—

Dominica	No. 9 of 1904	July 27, 1904.
Antigua	No. 5 of 1905	May 31, 1905.
Montserrat	No. 1 of 1906	March 27, 1906.
St. Kitts-Nevis	No. 3 of 1907	May 25, 1907.

All the Presidencies of the Leeward Islands had laws passed in 1897-98, which gave power of total prohibition. In Dominica, this early law (No. 3 of 1898) was repealed by No. 9 of 1904, and was afterward replaced by No. 6 of 1907. The earlier laws are still in force in the other islands. The Virgin Islands have no Ordinance dealing with imported plants more recent than No. 3 of 1897.

DOMINICA.

[L.S.] I assent.
CHARLES T. COX,
Acting Governor.

No. 9 of 1904.

27th July, 1904.

An Ordinance to provide for the fumigation of plants imported into this Presidency

Be it ordained by the Governor and Legislative Council of Dominica as follows :—

1. This Ordinance may be cited as 'The fumigation of plants Ordinance, 1904.' Short Title.

2. In this Ordinance the expressions hereinafter mentioned shall have the meanings assigned respectively to them as follows :— Definition of terms.

(*a*) 'Plants' includes growing plants, cuttings, buds, and grafts, bulbs, roots and seeds, and also fruit and vegetables intended for propagation and not for consumption as food.

(*b*) 'Packages' includes boxes, coverings, wrappers or anything whatever in which plants are imported.

(*c*) 'Port of entry' means the Port of Roseau and any other port or place in this Presidency appointed by the Governor for the importation of plants.

(*d*) 'Treasurer' includes every Officer of Customs.

(*e*) 'Agricultural authority' means the Curator of the Botanical Gardens, and includes every person acting in his aid or under his direction.

(*f*) 'Imported' means brought into this Presidency by any channel whatsoever, including the 'Parcels Post.'

(*g*) 'Importer' includes the owner and his Agents and Servants.

Port of entry.

3. The Governer may by Proclamation appoint one or more places (besides the Port of Roseau) as Ports of entry for the importation of plants.

All imported plants to be fumigated.

4. All plants imported into this Presidency together with the packages in which they are contained shall, subject to the discretion of the Agricultural authority, be fumigated.

By Agricultural authority.

5. All plants so imported shall be delivered up by the Importer to the Treasurer who shall cause them to be conveyed to the place of fumigation there to be dealt with by the Agricultural authority.

Place of landing.

6. No imported plants shall be landed elsewhere than at a Port of Entry.

Fumigating apparatus.

7. Suitable apparatus for the fumigation of plants shall be provided by the Government at the Botanical Gardens for use at the Port of Roseau ; and also at any other Port of entry appointed by the Governor for the importation of plants ; and such apparatus shall be under the care, control and management of the Agricultural authority.

Process of fumigation.

8. The process of fumigation shall be carried out in such manner and under such conditions as the Agricultural authority may consider adequate for the destruction of any vegetable or insect pests which may possibly be on such plants, subject to any rules or regulations by the Governor in that behalf.

Removal of plants after fumigation.

9. All plants shall be removed by the owner from the fumigation place after disinfection immediately upon his being required to do so by the Agricultural authority.

Disposal of plants after fumigation.

10. The Agricultural authority may require the importer to keep him informed as to the disposal of any plants after fumigation, and may visit and examine them at any time if necessary.

Expenses of removal.

11. The expenses of removal to the place of fumigation (except it be in large quantities) and of the fumigation of plants shall be at the expense of the Government, but the Government shall incur no liability in respect of any risk attending fumigation.

Penalties.

12. Any plants imported contrary to the provisions of this Ordinance shall be forfeited.

13. Offences against this Ordinance shall be punishable under the provisions of section 83 of 'The Trade and Revenue Act, 1894', upon summary conviction before a District Magistrate.

14. The provisions of the 'Trade and Revenue Act, 1894', shall apply to this Ordinance as regards the search for, seizure and disposal of plants imported contrary to its provisions.

Rules.

15. The Governor-in-Council shall have power to make Rules and Regulations for more effectually carrying out the provisions and intentions of this Ordinance.

16. 'The Plants Protection Act, 1898', is hereby repealed. Repealing clause.

W. H. PORTER,
President Legislative Council.

Passed the Legislative Council of Dominica the twelfth day of July, 1904.

J. A. PINARD,
Clerk Legislative Council.

Dated at Antigua the 27th day of July, 1904, in the Fourth year of His Majesty's Reign.

Duly published in the town of Roseau this 30th day of July, 1904.

C. MUSGRAVE,
Provost Marshal.

This is the first legislation, providing specifically for the fumigation of imported plants, to be enacted in the West Indies, except that of Jamaica, and in its provisions it follows closely on the Jamaica laws.

The Ordinance, it will be seen, provides for the Short Title Definition of Terms, and the designation of the Port of Entry in sections 1, 2 and 3. Section 4 gives the agricultural authority power to exercise discretion as to the fumigation of plants, and section 8 provides that 'the process of fumigation shall be carried out in such manner and under such conditions as the agricultural authority may consider adequate for the destruction of any vegetable or insect pests which may possibly be on such plants, subject to any rules or regulations by the Governor in that behalf'.

It would seem that these two sections taken together provide for all the emergencies which may arise in connexion with the fumigation of imported plants.

The Ordinance also provides (section 10) that the importer may be required to keep the agricultural authority informed as to the disposal of the plants and to allow the agricultural authority to inspect them from time to time.

The term fumigation, it is to be presumed, may be regarded as including disinfection in case the presence of fungoid diseases is known or even suspected, and it should be possible also to construe it to mean other fumigation or disinfection than that with hydrocyanic acid gas, since it is stated (sec. 4) that all plants imported into the Presidency shall, subject to discretion, be fumigated, and also (sec. 8) that the process of fumigation shall be carried out in such manner as the agricultural authority may consider adequate for the destruction of any vegetable or insect pests, which may possibly be on such plants. Vegetable pests may be taken to mean fungoid diseases, and the process of disinfection, to mean treatment with corrosive sublimate or Bordeaux mixture, if in the opinion of the agricultural authority either of these were adequate for the destruction of such diseases. Also while hydrocyanic acid gas is a satisfactory fumigant for dealing with certain insect pests likely to be present on nursery plants, it often happens that an agent such as carbon disulphide would

be more effectual in the case of seeds, bulbs, and especially in soil at the roots of plants.

These two sections (2 and 8) then would seem to cover the same points as those contained in the Barbados fumigation law, in the words fumigated or disinfected or both fumigated and disinfected.

Ordinance No. 9 – 1904 does not provide for total prohibition of importation of plants, but this is supplied in No. 6 of 1907. Further, the Ordinance does not give power to the agricultural authority to destroy plants which are found on arrival to be so badly diseased or infested that the means of treating them are not likely to be sufficiently efficacious to prevent the introduction of such diseases or pests.

It may be argued, however, that sufficient protection is ensured by the provision which enables the agricultural authority to be kept informed as to the disposal of the plants, and to be allowed to inspect them from time to time, on the assumption that the owner would be willing to destroy them if they showed signs of the development of diseases or pests which were new to the island, or which were known to be difficult or impossible to control. Section 15, which reads: 'The Governor-in-Council shall have power to make Rules and Regulations for more effectually carrying out the provisions and instructions of this Ordinance', might be taken as providing for this difficulty, since it is obviously the intention of the Ordinance to prevent the introduction into the island of diseases and pests of plants which may be injurious to the agricultural interests.

[L.S.] DOMINICA.

I assent.

BICKHAM SWEET-ESCOTT
Governor.

12th April, 1907.

No. 6 of 1907.

An Ordinance to provide against the importation of articles likely to introduce disease among plants.

Be it ordained by the Governor and Legislative Council of Dominica as follows :—

Short Title.

1. This Ordinance may be cited as 'The Plants Protection Ordinance, 1907'.

Power to prohibit by proclamation the importation of plants, &c.

2. Anything contained in 'The Fumigation of Plants Ordinance, 1904', to the contrary notwithstanding, it shall be lawful for the Governor-in-Council, by proclamation to be published in the *Official Gazette*, to prohibit absolutely the importation, directly or indirectly into this Presidency from any country or place named in such proclamation, of any plants, cuttings, bulbs, roots, seeds, or berries, or any earth or soil, or any article packed therewith, or any packages or other articles or things which in the opinion of the Governor-in-Council are or is likely to be a means of introducing any plant disease from such country or place. And any proclamation issued hereunder shall remain in force for such time as may be mentioned in that or any subsequent proclamation.

3. Any of the articles or things aforesaid, the importation of which into this Presidency has been prohibited by any proclamation as aforesaid, shall, upon importation, be forthwith seized by any Treasury or Revenue Officer or by any member of the Police Force, and shall be forfeited to His Majesty, and shall be destroyed or otherwise dealt with as the Governor may direct. And the importer shall be guilty of an offence and liable on Summary Conviction before a District Magistrate to pay a sum not exceeding Fifty pounds (£50).

Power to seize prohibited imports.

Penalty for importing prohibited imports.

4. So long as any proclamation is in force any of the articles or things aforesaid coming from parts beyond the seas may be deemed to have come from a place the importation from which is prohibited as aforesaid and may be treated accordingly unless the Importer satisfies the Treasurer or the Magistrate, as the case may be, to the contrary.

Onus of proof on importer.

DOUGLAS YOUNG,
Administrator.
President Legislative Council.

Passed the Legislative Council of Dominica the twenty eighth day of March, 1907.

J. A. PINARD,
Clerk, Legislative Council.

Dated at Antigua, the twelfth day of April, 1907, in the Seventh year of His Majesty's Reign.

Duly published in the Town of Roseau this twenty-third day of April, 1907.

C. MUSGRAVE,
Provost Marshal.

Proclamation dated February 5, 1909, under No. 6 of 1907 prohibits the importation into Dominica of all plants from Dutch Guiana which are likely to be a means of introducing any disease from that country.

ANTIGUA.

The Fumigation of Plants Ordinance, Antigua, No. 5 of 1905, dated May 31, 1905, is very similar in all its provisions to the Dominica Ordinance No. 9—1904, covering all the points mentioned above: and as in Dominica, there is no definite statement that the importation of all plants from any country may be prohibited. A Law (No. 4—1897, June 4, 1897) is still in force in Antigua, providing for the total prohibition of imported plants as in Montserrat, St. Kitts-Nevis, and the Virgin Islands.

[L.S.] ANTIGUA.

I assent.

GEO: MELVILLE,
Administering the Government,
Leeward Islands
4th June, 1897.

No. 4 of 1897.

An Act to provide against the importation of articles likely to introduce disease among plants.

Whereas it is apprehended that leaf and other kindred diseases in plants may be imported by means of plants, seeds, berries, earth, packages and otherwise;

And whereas it is expedient to protect the plantations of this Presidency against such introduction of disease;

Be it enacted by the Governor and Legislative Council of Antigua as follows:—

Short title.

1. This Act may be cited for all purposes as 'The Plants Protection Act, 1897.'

Prohibition of importation of certain things.

2. The introduction into the Presidency of coffee plants and uncured berries from Ceylon, Mauritius, Réunion, Fiji, Southern India, Sumatra, Java, Natal and such other places as may be included in any proclamation under this Act is hereby prohibited.

Power to prohibit by proclamation importation of certain other things.

3.—(1) The Governor may from time to time, with the advice of the Executive Council, by proclamation, to be published in the *Gazette*, prohibit, either absolutely or conditionally, the importation into the Presidency or any part thereof of any plants, seeds, berries, earth, soil or other article or thing packed therewith or any goods, packages, coverings, or other articles or things which there shall be reason to believe to be affected with disease, or which may have come, either directly or indirectly, from any country or place named in such proclamation, or which, in his judgment, may be likely to communicate disease to plants.

(2) A copy of every such proclamation shall be suspended at the Treasury and in each Police Station of the Presidency.

(3) Any proclamation under this Act may be varied or revoked by the like authority.

Penalty.

(4) Any person contravening Section Two of this Act or any proclamation published under the authority of this Act shall be liable, on summary conviction, to a penalty not exceeding twenty pounds.

Power to seize prohibited imports.

5. Every article or thing imported into this Presidency or any part thereof in contravention of this Act or of any proclamation under this Act may be seized by any treasury or revenue office, or by any member of the Leeward Islands Police Force, and shall be forfeited to Her Majesty and may be destroyed or otherwise dealt with as the Governor may direct.

Presumption of origin of imports of a prohibited kind.

6. Coffee plants and uncured berries and articles named in any proclamation in force under this Act, coming into the Presidency or any part thereof by sea, may be deemed to have come from a place the introduction thereof from which is prohibited by this Act and may be treated accordingly, unless the importer satisfies the Treasurer, or the principal treasury or revenue officer at the port of arrival, of the contrary.

CHARLES MAJOR,
Vice-President.

Passed the Legislative Council the 3rd June, 1897.

EDWARD B. JARVIS,
Acting Clerk.

Dated at Antigua the 4th day of June, 1897, in the sixtieth year of Her Majesty's Reign.

Duly published at Antigua the 5th day of June, 1897.

O. HUMPHREYS,
Provost Marshal

MONTSERRAT.

The Fumigation of Plants Ordinance, No. 1 of 1906, dated March 27, 1906, is identical with that of Antigua (5—1905), and in addition there is still in force No. 3 of 1897, dated April 20, 1897, which is also similar to the Antigua Law of that year.

This Ordinance, No. 3 of 1897, provides expressly (sec. 2) for the prohibition of the importation of coffee plants and uncured berries, and (sec. 3 [1]) for the prohibition either absolutely or conditionally of the importation into the Presidency of any plants, etc., which in the judgement of the Governor may be likely to communicate disease to plants.

ST. KITTS-NEVIS.

The Fumigation of Plants Ordinance, No. 3 of 1907, dated May 25, 1907, is identical with those in force in Dominica, Antigua and Montserrat, except in sections 4 and 14. In section 4 the word direction occurs instead of discretion, making the clause read: 'All plants imported into this Presidency together with the packages in which they are contained shall, subject to the direction of the Agricultural Authority, be fumigated.' In section 14, it is provided, among other things, that no person shall be liable to be punished twice for the same offence.

In St. Kitts, as in Montserrat, provision is made for the prohibition of all plants, etc., by an earlier Ordinance which is not repealed by the more recent one. St. Kitts Ordinance, No. 2 of 1897, dated April 24, 1897, is identical with the Montserrat Ordinance mentioned above. These two Ordinances were passed almost simultaneously, and make provision for exactly the same contingencies.

THE VIRGIN ISLANDS.

Ordinance No. 3 of 1897, dated June 10, 1897, is identical with the Ordinances quoted above—Montserrat, No. 3 of 1897, and St. Kitts-Nevis, No. 2 of 1897.

In this Presidency there is no provision for the fumigating or disinfecting of imported plants.

BERMUDA.

In Bermuda, legislation for the control of imported plants has been enacted (No. 14, 1899) with regulations (Jan. 12, 1901).

The Produce Inspection Act, No. 29, 1896, is entitled *An Act to provide for the Inspection of Potatos, Onions, and Tomatos, before exportation from these islands.* This Ordinance deals only with plants for export.

No. 14 of 1899, which prohibits the importation of bulbs, except under the regulations of the Board of Agriculture, is much more special in its application than the laws in other colonies, since it deals with only one

kind of plant. It provides for the cleaning, disinfection, purification and treatment of imported bulbs, but it does not state how these processes shall be carried out, nor what insecticide or other substance shall be used; but the Board of Agriculture is authorized to make the necessary regulations. The regulations, dated January 12, 1901, do not say by what means the treatment of the bulbs shall be carried out.

BERMUDA, No. 14—1899.

An Act for the protection of the Bulb Industry in these Islands.

[*5th September, 1899.*]

Whereas the cultivation of bulbs for exportation has become an important branch of industry in these Islands, and it is deemed necessary to take precautions against the importation and propagation of unsound, diseased or infected bulb stock;

We therefore, &c., be it enacted, &c:

Importation of bulbs prohibited except under regulations of Board of Agriculture.

1. The importation or landing in these islands of bulbs of every or any description other than such as the Board of Agriculture shall see fit to exempt from the restrictions of this Act, except under and subject to such safeguards and conditions as the Board of Agriculture shall from time to time prescribe under Regulations to be made under this Act for the prevention of the importation of diseased, infected, unsound or unhealthy bulbs, or such as are or may be suspected to be infected with injurious parasites or growths and of the packages and wrappings in which they are contained, and the covers soil and other materials in or with which they are packed, is hereby prohibited.

Board of Agriculture authorised to make regulations for the treatment and purification of imported bulb stock.

2. The Board of Agriculture is authorised to make and publish such Regulations for the inspection, examination removal and treatment before at or after importation or landing of bulbs to which this Act applies, and of the packages, wrappings and other things in or with which they are packed, and for the cleaning disinfection purification and treatment of such bulbs, or if necessary in the opinion of the Board, the destruction of any imported stock, before at or after the landing of the same, and from time to time revoke vary or alter such Regulations, and to take all such measures and precautions as may seem expedient to the Board for the prevention of the importation of any diseased or suspected bulbs, either generally or from any particular place or country mentioned in such Regulations, and to take all other ways and means to prevent the importation or propagation of unhealthy stock or of any bulbs in an unhealthy or foul condition, as to the Board shall seem necessary or expedient.

Importers of bulbs bound to carry out regulations.

3. Every importer or consignee of bulbs to which this Act applies shall be bound to carry into effect at his own expense and observe and obey the Regulations of the Board of Agriculture for the purification and treatment of such bulbs made and published under the provisions of this Act: and every such importer or consignee who shall offend against any Regulation made under this Act shall on conviction before any two Justices be liable to a penalty not exceeding twenty

pounds to be sued for and recovered with costs of prosecution by the Board of Agriculture or by any person authorised by the Board to prosecute for the same.

4. The Board of Agriculture or any member of the Board shall not be liable for any loss of or damage done to or sustained by any imported bulb stock subjected to any disinfecting or other process or treatment under any Regulation to be made under this Act: and all expenses attending the landing removal carriage transport and treatment of any bulbs treated under this Act or under the Regulations, shall be borne by and may be recovered from the owner or consignee of the bulbs by any person authorised by the Board to sue for the same.

The Board not to be liable for any loss sustained by the treatment of bulbs under the provisions of this Act.

5. It shall be the duty of the respective Officers of the Revenue Department to carry into effect, and, as far as practicable, enforce the provisions of this Act, and to afford to the Board of Agriculture and its officers or servants every reasonable facility for carrying into effect the provisions of this Act and the Regulations of the Board of Agriculture.

The Revenue Officers to be assistant in carrying out the Regulations of the Board.

6. The Receiver General shall be and he hereby is authorised and required to pay out of the Public Treasury to the order of the Board of Agriculture or any three members of the same, of whom the Chairman shall be one, any sums of money not exceeding three hundred pounds in any one year for carrying into execution the powers and duties of the Board under the provisions of this Act.

Grant to Board of Agriculture for the purposes of this Act.

7. The expression in this Act 'bulbs to which this Act applies' shall mean all bulbs except such as are exempted from the provisions of this Act by the Board of Agriculture.

Meaning of 'bulbs to which this Act applies.'

8. This Act may be cited as the Bulbs Act, 1899.

9. This Act shall continue in force until the thirty-first day of December One Thousand and Nine Hundred.

Duration clause.

Regulations made on the 5th day of September, 1899, by the Board of Agriculture under the Bulbs Act, 1899, as amended by order of the Board of Agriculture.—12 Jan. 1901.

1. The term 'Bulbs' in these Regulations includes Lily, Hyacinth and Narcissus bulbs.

2. Onions, Leeks, Eschalots, Garlic, and all Corns are exempted from the restrictions of this Act.

3. Owners or consignees of bulbs imported into these Islands shall notify in writing signed by the consignee the Superintendent of the Botanic Station as early as practicable of such consignments.

4. Consignments of bulbs will not be delivered without the authority of the Superintendent who will take and retain control of such consignments, for not less than 4 days for such inspection and treatment as may appear to him to be expedient.

Amended.

5. The Superintendent may require such consignments to pass through the Public Garden for inspection and treatment.

Amended.

6. The Superintendent is authorised to hire any conveyance or labour or make any such arrangement which, in his opinion, is necessary to convey any such consignments to the Public Garden.

7. After treatment the owner or consignee of any bulbs which have been treated is required to pay the expenses incurred and to remove the same within 48 hours, failing in which he will be chargeable for the storage of the bulbs at such rates as the Board shall sanction; and if the expenses are not paid and the bulbs removed within 4 days after notice to the owner or consignee to remove the same such bulbs may be destroyed or otherwise disposed of as the Board shall direct.

Substituted.

8. All bulbs which in the opinion of the Superintendent are diseased and which he thinks might be injurious to the Lily industry shall be destroyed.

Amended.

9. All bulbs brought into the Colony contrary to these Regulations may be seized and destroyed or otherwise dealt with.

10. Parcels of Bulbs by parcels post will not be delivered until after inspection, and if necessary treatment by the Superintendent and all expenses paid.

By order of the Board,

A. G. MONTAGU,
Clerk to the Board of Agriculture.

BAHAMAS.

In 1899, the Governor of the Bahamas, replying to the despatch of the Secretary of State for the Colonies, stated that there seemed to be no occasion for the passing of laws to provide for the prohibition or other control of imported plants on account of the very limited agricultural possibilities in those islands. The following is an extract:—

'The agricultural interests of this Colony must always be of a very limited character in view of the physical conformation of these islands, which are mainly composed of coral limestone rock, and it is only in very restricted areas that soil exists capable of any very extended agricultural operations. Cultivation, it may be said, is wholly confined to pine-apples, oranges and other species of the citrus family, and latterly the 'Agave' which produces the Sisal fibre, and it is very improbable that there will ever be any important additions to the economic products of this Colony. In regard to plant diseases, beyond the occurrence of what is popularly known as the 'Scale Insect' (probably a species of Aspidiotus) which attacks the orange trees, I am not aware that any trouble is experienced. Neither the pine-apple nor the Agave seems to be subject to disease which calls for special attention and any question of legislation on the lines suggested in your despatch would appear to be superfluous.'

The preceding pages give an account of the laws intended to deal with imported plants for the purpose of preventing the introduction of pests and diseases in all the British Colonies in Tropical America, so far as the writer has been able to learn of them.

It will be seen that in all the Colonies, except in the Bahamas and British Honduras, laws are in force to assist in protecting agricultural interests, by attempting to prevent the introduction of pests and diseases that might be transported through the medium of imported plants.

The provisions of the laws for this purpose fall under four heads: (1) total prohibition, (2) destruction of badly infested plants on arrival, (3) treatment of plants on arrival, to kill pests or diseases which may be known or suspected to be on them, and (4) inspection of suspected plants from time to time for a certain period, with power to destroy such plants if they are found within that time to be affected with any serious pest or disease.

The earlier laws, which are listed on page 198 of this paper, all come under the first head; they provide for the total prohibition of the importation of plants. Some of these are still in force, while others have been repealed. All these colonies, however, have laws by means of which total prohibition may be proclaimed against plants of certain kinds, from all places, all plants from certain places, or all plants from all places.

It may be well to mention that the term plant is intended to cover all plant-material, together with all packages, packing, etc. Thus all seeds, bulbs, roots, etc., if intended for propagation, are included, but fruits, vegetables, etc., intended to be used at once as food are not included.

No law is recorded as existing at British Honduras or in the Bahamas, and the law at Bermuda is designed only for the protection of the lily industry.

The other laws are general, Barbados making a definite pronouncement against seed-cotton for ginning, and cotton seed for planting and for the purpose of oil production. British Guiana, Trinidad, Grenada and St. Vincent make special mention of cacao by proclamation, while Dominica, also by proclamation, prohibits all plant importation from Dutch Guiana, and St. Lucia from South America.

Most of the laws quoted give the agricultural authority discretion in the matter of prescribing the treatment to be given to imported plants. This might also apply to the exemption from treatment of certain plants considered liable to be the means of introducing pests or diseases, such as tomato, cabbage and other vegetable seeds, and ordinary flower-garden seeds, sent out by reputable seedsmen in Europe or America. These are put up in sealed packets and are not likely to introduce any pest or disease which would seriously affect any of the crops in these islands. A problem still to be solved is that of treating plant material intended to be eaten, such as sweet potatos. The scarabee of the sweet potato (*Cryptoryhnchus batatae*) is found in most, if not all, of these islands, and there is little danger of serious damage resulting from its transporta-

tion from one to another, but it affords an example of the way in which an insect pest might be introduced in plant material intended to be eaten. Another sweet potato weevil (*Cylas formicarius*) is common in certain of the Southern States and in Jamaica. It has recently been reported as occurring in British Guiana. This insect sometimes occurs as a serious pest, and might easily be transported with the potatos to new localities. *Cylas formicarius* is stated to have been found in Barbados, but there is no evidence of its occurrence at the present time.

The power to provide for careful inspection, and then to destroy plants found to be infested with pests and diseases which are not likely to be controlled by any available means of disinfection, is very useful, and might prove a means of preventing the introduction of new or little known diseases, as well as those which are well known. Various borers would come under this head. Sweet potatos infested with the borer mentioned, and fruit infested by the fruit fly might also be included here.

The fruit fly (*Ceratitis capitata*) has been a serious pest in Bermuda, but legislation has been enacted, requiring the destruction of all fruit in the island for two seasons, and this pest has been brought under control. This was accomplished under the provisions of the Fruit Fly Destruction Act, 1907, which came into force on March 1, of that year.

In Trinidad and Grenada, in addition to the laws which deal with imported plants, laws are in force to provide for the control of pests and diseases within the island.

FUNGI CAUSING DISEASES OF CULTIVATED PLANTS IN THE WEST INDIES.

BY C. K. BANCROFT, B.A. (Cantab.).

GENERAL INTRODUCTION.

The scope of this paper is indicated by the author's introduction which states: 'In the following pages an attempt is made to give a brief descriptive account of those fungi which have from time to time been reported to be injurious to cultivated crops in the West Indies. The fungi are dealt with in the order of their systematic classification. Those who are desirous of obtaining further information respecting the life-histories of the parasites described can do so by consulting the literature quoted in connexion with the description of each species.'

Some of the fungi causing diseases of minor importance have not been included by Mr. Bancroft, probably owing to the fact that there is, as yet, no published record of their appearance in the West Indies. These omissions have been supplied in most cases by Mr. F. W. South, B.A., Mycologist to the Imperial Department of Agriculture, from the records kept at the Head Office of the Department, thus bringing forward information which was not accessible to Mr. Bancroft. These additions are marked with an asterisk.

A few fungi of minor importance have not been definitely identified, and consequently, have been omitted. With this exception, every effort has been made to render the account as complete as possible, and any omissions that may occur are due mainly to the absence of complete literature on the subject.

A note has been added containing a summary of the diseases probably caused by bacteria, a complete investigation of which, however, has not yet been undertaken.

All controversial matter has been avoided as far as possible, but an appendix by the Mycologist has been added, dealing very briefly with two points of which the importance could not be entirely disregarded. The first is an explanation of the attitude adopted toward the question of the relationship of *Trichosphaeria sacchari*, Massee, to *Thielaviopsis ethaceticus*, Went; and the second relates to the difficulties connected with the nomenclature of the fungi in the group Sphaerioidaceae, Phaeodidymeae, which embraces two important diseases of cacao and a disease of cocoa-nuts in the West Indies, in addition to an equally serious disease of *Castilloa elastica* and *Hevea brasiliensis* in the East.

by F.W. South

PHYCOMYCETES.

PERONOSPORINEAE :—PERONOSPORACEAE.

Phytophthora omnivora, de Bary. (Black rot of Cacao Pods.) This disease is known in Ceylon as the 'Brown Pod' disease. Within recent years it has become much more general and destructive to cacao pods in Trinidad. The shell of the pod darkens first at one end, the darkening then spreading over its entire surface. The mycelium permeates and destroys the entire substance of the pericarp of the fruit and often attacks the seeds as well, the whole fruit thus becoming valueless. The conidial form of reproduction of the fungus appears on the surface of the pod as a white mould. Sexually produced oospores are formed in the diseased tissue of the pod and are liberated when the pod decays.

This fungus attacks many different plants, more especially in the seedling condition. It has also been reported to cause a disease of cultivated tomatos in England, and of various other plants throughout the world.

Diagnosis :—

Hyphae branched variously, haustoria absent; conidiophores slender, simple or sparingly unilaterally branched; conidia lemon-shaped, the size varying from 25 × 20 *Microns* to 60 × 40 *Microns*. Oospore globose, smooth, yellowish-brown, 20 – 30 *Microns* diam.

Hartig & Somerville. *Diseases of Trees*, p. 38.

Massee. *Kew Bulletin*, 1899.

Faber. *Die Krankheiten und Parasiten des Kakaobaumes*, p. 197.

Peronospora trichotoma, Massee. *Colocasia esculenta*, the tubers of which yield an important food, is known as 'eddoe' in Barbados, 'coco' in Jamaica and 'tania' in Trinidad. The fungus attacks the tubers of the plant. The disease was described by Mr. Massee in 1888, having been reported to have been doing damage to cocos in Jamaica in that year. The cut surface of the tuber has a number of bright yellow spots on it when the disease is in the incipient stages, these spots corresponding with the vascular bundles. The spots later become brown or blackish, and the intermediate portions of the tuber are tinged brown, showing that the mycelium has then spread to the ground-tissues between the vascular bundles. Entrance of the fungus is effected at a wounded surface where the skin of the tuber has become broken. Conidia are produced superficially, and oospores are formed in the decaying tissue.

Diagnosis :—

Mycelium thick; haustoria clavate; conidiophores fasciculate 2-3 times trichotomously divided; conidia small, obovate or subglobose 12 × 10 *Microns*; oospore globose; epispore brown with anastomising ridges, 35 – 40 *Microns* diam.

Massee. *Journ. Linn. Soc.*, XXIV, p. 45, 1888.

Peronospora cubensis, Berk & Curt. (Cucumber mildew.) A delicate, white mould occurs on the under surface of the leaves of many cucurbitaceous plants, and may sometimes prove to be very destructive if it is allowed to go on unchecked.

The disease has been recorded in the United States and in Japan: in addition to the cucumber it attacks the pumpkin, melon, squash, etc.

Massee. *Text-book Plant Dis.*, p. 80.

ASCOMYCETES.

Discomycetes.

Sclerotium sp. (Coffee Leaf Blight.) This disease of coffee has been reported to occur in Porto Rico. The fungus appears to attack the root system, first producing disease, and then ascends the stem by means of brown or black strands; when these strands reach a leaf they spread and form a cob-web-like structure. The leaf dies, but remains attached to the branch by the mycelium of the fungus. The fungus has been referred to the genus *Sclerotium*.

Porto Rico *Agric. Exp. Station Report*, 1904, p. 399.

Plectascineae :—Aspergillaceae.

Penicillium sp. (Black Heart or Core Rot of Pine-apple.) In 1901, pine-apples in Antigua were shown to be suffering from this disease. When a pine-apple is attacked it presents little external sign of disease; the fruit, as a rule, ripens unevenly, and segments or groups of segments here and there remain pale-green in colour. When a diseased fruit is cut open, black patches can be seen extending from near the outside towards the centre; these patches occur opposite to the pale-green spots on the surface. Later on, brown patches appear on the surface of the fruit and the surface becomes shrunken in places. A species of Penicillium occurs in the diseased fruitlets (eyes) and is thought to be the cause of the disease. In Queensland, where the 'Smooth Cayenne' variety suffers from the same disease, inoculation experiments have shown that the fungus can only effect an entrance into the fruit at a wounded surface, and the punctures produced by insects are considered to provide a point of entrance for the fungus. In the West Indies two insects commonly occur in the 'eyes'; these are a mealy bug (*Dactylopius* sp.) and a mite. It is, therefore, thought that these, by puncturing the pine-apple, afford a means of entrance for the fungus.

Stockdale. *West Ind. Bull.*, Vol. VIII., p. 161.

Meliola spp. (Sooty mould of Orange.) The leaves, and sometimes the fruit also, of the orange are frequently covered by a black incrustation, which constitutes the mycelium of a fungus belonging to the Aspergillaceae. The mycelium forms a compact membrane on the upper surface of the leaf, which frequently cracks and peels off in patches. The

fungus is not parasitic, but merely follows aphides and other insects which secrete 'honey-dew'. Injury is done to the trees by preventing the leaves from performing their proper functions: fruit covered by the fungus is also injured and is frequently rendered unsaleable. The black incrustations probably occur wherever the orange is cultivated, and are caused by different species of the genus *Meliola* in different countries.

Diagnosis of the genus *Meliola*:—

Perithecia seated on superficial spots or effused patches of black, radiating mycelium, globose, mouthless, membranaceous, often surrounded by specialized appendages; asci usually short and broad, 2-8-spored; spores typically oblong, 2-5-septate, fuscous. Sometimes truly continuous and hyaline.

Swingle & Webber. *U.S. Dept. Agric., Div. Veg., Path. and Physiol., Bull. 8.*

Massee. *Journ. Bot.*, Vol. VI, p. 357.

Unicula spiralis, Berk. & Cooke.* This fungus causes the well-known powdery mildew of the grape vine, and has been found on grapes in Barbados.

PERISPORIALES :—PERISPORIACEAE.

Capnodium mangiferum,† Cooke & Broom. (Mango Black-Blight.) This is a black, incrusting, non-parasitic fungus which forms black patches on both sides of the leaf of the mango (*Mangifera indica*). The fungus spreads rapidly and forms a coating over the leaf-surface, thus interfering with the functions of the leaf; in this way great injury is frequently done to the trees. It seems probable that the fungus follows aphides, scales, and such insects as produce honey-dew.

Diagnosis:—

Mycelium incrusted, effuse, sometimes almost covering the entire surface of the leaf, velvety, intensely black; perithecia globose-pyriform, rounded at top, mouth absent; asci obovoid, rounded at the apex 48 – 50 × 30 *Microns*; spores 8, 1-septate, hyaline, elliptical, slightly constricted at the septum, 12 – 15 × 5 – 6 *Microns*.

Massee. *Text-book Plant Dis.*, p. 103.

Cooke & Broom. *Grev.* IV, p. 47.

HYPOCREALES :—NECTRIEAE

Nectria Bainii, Massee. (Cacao Pod Disease.) This fungus was first reported to be doing damage to cacao pods in Trinidad in 1898. Semicircular blotches make their appearance on the pod, and the diseased parts become soft and watery. Later on, they become covered with a yellow or

† The question of nomenclature connected with the genera *Meliola* and *Capnodium* is complicated. Some authors have expressed the opinion that fungi described as species of *Capnodium* are identical with certain species of *Meliola*. [F.W.S.]

orange-coloured mycelium which is studded with minute, bright-red perithecia. The perithecia are often preceded by a small Fusarium-like mould, whitish in appearance; the connexion between these stages has not yet been established.

Diagnosis :—

Perithecia gregarious, beset by a yellow or orange mycelium, spherical, red, 300 – 350 *Microns* diam.; asci cylindrical, clavate, shortly stalked, 8-spored, 80 – 90 × 7-9 *Microns*, spores elliptic-oblong, subacute at both ends, uniseptate hyaline 10 – 12 × 5 *Microns*.

Massee. *Kew Bulletin*, 1899, p. 1.

Hart. *West Ind. Bull.*, Vol. I, p. 422.

F. von Faber. *Die Krankheiten und Parasiten des Kakaobaumes*, p. 216.

Nectria theobromae, Massee. (Canker Disease of Cacao.) This disease was investigated by Howard, from Grenada, in 1901. It has since been met with in Trinidad, Dominica, St. Lucia and St. Vincent. The fungus attacks the stem of the cacao tree, the first recognizable symptom being the production of a red, gummy liquid which oozes out from the bark. The bark, when cut, is found to be red, and the discoloration extends as far inwards as the young wood. The path by which the diseased area spreads varies; it may be a narrow band and may ring the tree, in which case death soon results; or it may spread in different directions without encircling the tree, in which case death is slower. The branches above the diseased area die, those just above that area dying first. In the early stages of the disease two conidial forms make their appearance: one is a form of Fusarium-like conidia, which are budded off from short hyphae, and the others are unicellular conidia. The perithecia are produced later and are red in colour. These can be found most frequently during the rainy season.

Calonectria flavida, Massee, may occur along with *Nectria theobromae*, or without it. The perithecia are yellow and produce 3-septate ascospores.

The connexion between the conidial and ascigerous forms has not yet been established.

Fusarium conidia 5 – 7-septate, 50 – 80 × 4·5 – 8·5 *Microns*.
Unicellular conidia elliptical 6·6 – 11 × 4·4 *Microns*.
Calonectria ascospores 22 × 9 *Microns*.

Howard. *West Ind. Bull.*, Vol. II, p. 200.

Stockdale. *West Ind. Bull.*, Vol. IX, p. 171.

Nectria ipomoeae,* Hals. The sweet potato (*Ipomoea Batatas*) and the egg-plant (*Solanum Melongena*) are attacked by this fungus.

The stems wither and are covered with a white mould which is the fusarium condition of the fungus. Later on, clusters of flesh-coloured perithecia appear on the diseased

*The *Tubercularia* stage of a species of *Nectria* has also been observed on pigeon peas in Trinidad (*Trinidad Bull.*, Vol. IV, p. 313.)—[*F. W. S.*]

stems. The disease shows itself first near the ground-line and then spreads to the stem and root.

Diagnosis :—

Perithecia in little clusters, conico-globose, papillate, red ; asci cylindric-clavate, 8-spored : spores hyaline, cylindric-oblong, 1-septate, slightly constricted at the septum.

Halsted. *Rep. N. Jersey, Agric. Expt. St.*, 1891, p. 281.

Massee. *Text-book Plant Dis.*, p. 132.

Calonectria gigaspora, Massee. This species is described from Trinidad as occurring in the channel produced by the moth borer in the stem of the sugar-cane.

Diagnosis :—

Perithecia aggregated, obovate, glabrous, scarlet, 1 mm. high ; asci very long, 8-spored, paraphyses absent ; spores hyaline, fusoid, at length 3-septate, 90 – 100 × 20 *Microns*.

Hart. *Trinidad Bull.*, 1901, p. 335.
Massee. *Kew Bulletin*, 1906.

Sphaerostilbe flavidum, Massee. (Coffee Disease, of the New World.) This disease is known as 'spot' or 'small pox' in allusion to the spotted appearance of the leaves, young shoots and fruits of infected trees. It has been reported to occur in Guatemala, New Granada, Costa Rica, Venezuela, Nicaragua, Dutch Guiana and Brazil,† but there is not yet any account of its occurrence in the West Indies.

On infected leaves scattered, circular, whitish patches are formed, equally evident on both sides of the leaf. These leaves become yellowish and fall, in some cases complete defoliation of the plants resulting. On the shoots the spots are whitish and more or less elongated. The fruit of the fungus appears on the spots as small, yellowish, pin-like structures from 1·5 to 2 mm. high. The free tip of each hypha swells and becomes subglobose, and from this spring slender, simple or sparingly branched conidiophores, each of which bears a single subglobose conidium at its apex. The conidia are hyaline and 2·5 *Microns* in diameter. This condition is known as *Stilbum flavidum* or *Stilbella flavida*. This fungus has recently been shown to be the conidial form of Sphaerostilbe, an ascigerous genus. All attempts to infect coffee plants with the conidia of *Stilbum flavidum* have failed ; the conidial stage of the fungus may, therefore, be concluded to be effete. The ascigerous stage is developed on the whitish patches of the stem and fruit, but not on the leaves. The fungus must, therefore, be reproduced by ascospores only.

Diagnosis :—

Perithecia ovate, densely massed into suborbicular irregular patches, slightly reddish, verrucose, with a slightly prominent papillate ostiole. Asci cylindrical,

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†The fungus has also been found very recently in Dominica. (*Agric. News*, Vol. VIII, p. 292). [F.W.S.]

abruptly truncate above, 8-spored. Spores hyaline, ellipsoidal pointed at both ends, unseptate $15 \times 6 - 7$ *Microns.*

Massee. *Text-book Plant Dis.*, p. 445.

Massee. *Kew Bulletin*, 1909, p. 337.

SPHAERIALES :—SPHAERIACEAE.

Rosellinia Hartii, Massee.* This fungus has been found occasionally on cacao and also on *Ficus indica* in Trinidad ; it is apparently destructive but not common.

Hart. *West Ind. Com. Circular*, Vol. XXIV, p. 511.

Trichosphaeria sacchari, Massee. (Rind Fungus of Sugar-cane.) This disease for a time almost paralysed the sugar industry in Barbados and other West Indian Islands ; it has also been reported from Mauritius, India, Java and Queensland. Attention was first called to the fungus in Trinidad, in the year 1893. The fungus gains access to the interior of the sugar-cane at a wounded surface, such as through the broken ends of lateral shoots, leaf-bases, etc., but more especially through wounds made by the moth-borer insect (*Diatraea saccharalis*), and possibly sometimes by the shot borer (*Xyleborus perforans*). In the interior of the cane the fungus first follows the course of the vascular bundles producing bright-red, longitudinal streaks ; the hyphae then attack the fundamental tissue, entering the cells by the pits in the cell-walls. Three distinct means of propagation have been attributed to this fungus :—

(1) The Melanconium stage.

The spores ooze out from the surface of the cane in the form of black, curved tendrils. The conidia are formed in conceptacles produced under the epidermis. Conidia unicellular, pale-brown, cylindrical, straight or slightly curved, $14 - 15 \times 3{\cdot}5 - 4$ *Microns.* The conidia generally form two germ-tubes and give rise on germination to the second stage of the fungus.

(2) The Macroconidial stage.

This forms an intense, black, velvety layer lining cracks and crevices in decaying canes. The conidia are produced in chains originating within the ruptured apex of a hypha ; the terminal conidium is globose, $20 - 25$ *Microns*, the others barrel-shaped, $18 - 20 \times 12$ *Microns*, blackish-brown. The microconidial stage is similar in origin and structure to the macroconidial, growing on the diseased surface of the cane and forming black, velvety patches. The microconidial form is a modification of the macro-form, developing from the same hyphae and probably owing its peculiarities to light, exposure, etc

(3) Ascigerous stage.

The perithecia are produced by the mycelium which bears microconidia; they occur on dead or more or less decayed canes. Perithecia broadly ovate, blackish-brown, sparsely clothed with long, dark, rigid hairs; asci cylindrical; spores eight, hyaline, continuous, elliptic-oblong, 8 - 9 × 4 *Microns*; paraphyses absent.

The melanconium stage is the form destined for rapid reproduction and can reproduce itself continually without the intervention of any other spore-form.

Recent work on the raising of resistant varieties of sugar-cane has met with a good measure of success.

Massee. *Ann. Bot.*, 1893, p. 515.

Howard. *Ann. Bot.*, XIV, p. 617 (1900).
" " " XVII, p. 373 (1903).

(Pine-apple Disease.) Pine-apples that have been packed for shipping or storing frequently show signs of fungous disease. The commonest fungus present is *Trichosphaeria sacchari*, the rind fungus of the sugar-cane.

Diseased pines are soft and watery in patches, and a distinct odour of ethyl acetate is emitted from these diseased areas. The fungus can only effect an entrance at a wound, i.e., at bruises on the fruit, produced in picking, or at the cut end of the fruit-stalk.

Stockdale. *West Ind. Bull.*, Vol. VIII, p. 163.

PLEOSPORACEAE.

Leptosphaeria sacchari, Breda de Haan. (Ring-spot of Sugar-cane.) Occurs in the West Indies, Java and India. The disease commences in the form of small, purplish spots on the leaf surface; these spots increase in size, and as they expand, dry up in the centre. Each spot takes the form of a ring consisting of a purple or brownish band, outside which is a yellow area of the leaf. Finally, the spots become large and elongated and frequently run together.

On the surface, the hyphae produce curved, usually 3-4-septate spores; these have been shown by Breda de Haan to be capable of infecting healthy leaves. Later on, a second spore-form appears in the form of black dots on the upper surface of the leaf; the dots are arranged in rows and are visible to the naked eye.

Diagnosis :—

Perithecia 140 *Microns* diam.; ascospores 3-septate, 20 - 24 x 5 *Microns*, brownish.

Butler. *Memoirs of Dept. Agric. in India*, Vol. I, No. 3.

Wakker & Went. *De Zietken van het Suikerriet op Java*, p. 149.

VALSACEAE.

Eutypa erumpens, Massee.* This fungus is reported as causing the death of several trees including cacao, nutmeg,

Barbados evergreen (*Ficus* sp.) and many forest trees. It occurs in Trinidad, Barbados and Grenada. The fungus is probably a wound parasite. It forms irregular black patches on the bark, varying in size from one-half to two or more inches in diameter. These patches have a dull rough surface, and the perithecia of the fungus are sunken in them, so that only the short, beak-shaped ostioles project. The asci are club-shaped, 8-spored and borne on long stalks. The spores are unicellular and transparent.

Bull. Agric. Inform., Trinidad, 1909. No. 61.

BASIDIOMYCETES.

HYMENOMYCETINEAE :—AGARICACEAE.

Marasmius equicrinis. Müller. (Horse-hair Blight of Cacao.) This appears like a tuft of horse hair caught in the twigs of the tree. Some of the threads are closely attached to the bark, and the mycelium resembles that of the thread-blight in some respects.

Diagnosis :—

White to yellowish, pileus membranaceous, convex, obtuse, 1 – 2 mm. broad ; stalk 1 cm. or more long, bristly, rigid, black, shining, rising from the black, horse-hair-like mycelium ; lamellae few, separated, paler than the pileus.

Stockdale, *West Ind. Bull.*, Vol. IX, p. 179.

Cooke. *Grev.* VIII.

Saccardo. *Syll.* V, p. 553.

Lewton-Brain. *West Ind. Bull.*, Vol. VI, p. 87.

Marasmius sacchari. Wakker. (Root Disease of Sugar-cane.) This disease has caused great loss to sugar-cane growers in the West Indies, and was especially prominent in Barbados in 1904. The affected plants show symptoms resembling those produced by a deficient water-supply. The leaves become dry and withered; fewer leaves are produced, and the lower leaves, which normally fall away from the stem and form 'trash' on the ground, remain attached. The stools are dwarfed and but loosely fixed in the soil, so as to be easily uprooted. The fungus attacks the roots; the younger roots are short and red at their tips. The proper absorption of water and nutrient salts by the plant is thus checked, and the parts above ground, in consequence, show the symptoms here described. The lowest leaf-sheaths can be seen to be matted together by a white mycelium. The fructifications of the fungus appear as toad-stools at the base of the attached stools; they are white, delicate structures.

Diagnosis :—

Gregarious or fasiculate at the base, variable, flesh membranaceous, persistent; pileus white, broadly campanulate, then dingy-white and plane or cup-shaped, 15 mm. diam.; gills white, simple or bifurcate; stem central,

white, 15 mm. long, apex tubiform, base villous, hyphae white; spores hyaline, continuous, irregularly oblong, ends attenuated, rounded, 16-20 × 4-5 *Microns.*

Lewton-Brain. *West Ind. Bull.*, Vol. VI, p. 34.

Wakker. *De Zietken van het Suikerriet op Java*, p. 194.

Marasmius hawaiiensis, Cobb, is reported to cause a root disease of sugar-cane in Hawaii, and is considered to be a different species from *M. sacchari.*

Cobb. *Hawiian Sugar Planters' Assocn. Report*, No. 6.

Marasmius plicatus is reported to cause a root disease of sugar-cane in Louisiana.

Marasmius sp. probably causes root disease of sweet potato, and possibly also of Guinea corn, Imphee, and Indian corn.

Marasmius semiustus, Berk. & Curt. (Banana Disease.) Certain of the banana trees in Trinidad and other of the West Indian Islands have been reported to be affected by this fungus. The mycelium permeates the tissues of the banana 'stem' and attacks the inflorescence as it is growing up the centre of the leaf-sheaths which form the so-called 'stem'. On the surface of the 'stem' can be seen the fructifications of the fungus frequently growing in immense numbers. Numbers of minute, whitish sclerotia occur in the diseased tissues.

Pileus ½-1 inch across, thin, yellowish-brown; gills wide apart, thin and dirty white; stem ½-¾ inch long, thin with a flattened foot of attachment.

Diagnosis :—

White, becoming rufous when dry; pileus eccentric, convex, then plane, glabrous; gills approaching the stem, connected by wrinkles; stem compressed, glabrous, 2-3 mm. diam. The fungus was first described from Cuba in 1867.

Journ. Linn. Soc., 1869, Vol. X.

Massee. *Text-book Plant Dis.*, p. 387.

Schizophyllum commune, Fries. (Sugar-cane Agaric.) This fungus is said to be a parasite on the stems of cultivated sugar-cane in the West Indies. It has also been recorded to be parasitic on the mulberry tree by Prillieux. It is however more frequently saprophytic.

Diagnosis :—

Pileus fan-shaped, very thin, white or grey, downy, often lobed, 1–2 inches broad; gills pale-brown with a purple tinge, split portions of the edge of the gills revolute; spores dingy, 4 – 6 × 2 – 3 *Microns.*

Massee. *Text-book Plant Dis.*, p. 207.

Prillieux & Delacroix. *Bull. du Min. de l' Agric.*, No. 5, Sept. 1893.

Polyporaceae.

Polystictus hirsutus Fr.* This fungus is probably a partial parasite, and has been found on limes in Dominica.

THELEPHORACEAE.

Corticium lilaco-fuscum, Berk. & Curt. (Pink Disease of Cacao.) The disease, though reported to occur in Dominica and St. Lucia, does not seem to be of a serious nature. Pinkish incrustations appear on the branches of the tree; these are composed of closely packed, adpressed, fungal hyphae. The hyphae may penetrate the bark and extend as far as the young wood. When the branches are thus affected, the bark cracks and peels off. The fungus itself seems to do little damage, since the bark is easily renewed: but it forms places of entrance for wound fungi, notably the cacao canker fungus.

Diagnosis of genus *Corticium*:—

> Hymenophore broadly effuse, entirely adnate to substratum; hymenium smooth, waxy, consisting of basidia and paraphyses only, springing directly from the mycelium; spores continuous, hyaline; basidia typically tetrasporous. Petch suggests that this may be identical with *Corticium javanicum*, which attacks *Hevea brasiliensis*, tea and other plants in Ceylon, Java, etc.

Stockdale. *West Ind. Bull.*, Vol. IX, p. 178.
Petch. *Agric. Journ. Royal Bot. Gdns., Ceylon*, Vol. IV, 1909.

(**Unidentified.**) Thread-blights of cacao have been reported to occur in Trinidad and in St. Lucia.

The mycelium of the fungus takes the form of threads which are closely adpressed to the bark of the tree. These threads run along the twigs and branches and, when young, are thin and white, but darken and thicken as they grow older. The buds are covered by a white felt caused by the branching and expansion of the threads, and the under surfaces of the leaves are also frequently covered.

The hyphae composing the thread give off strands which grow into crevices in the bark on the older parts of the tree; on the young twigs, however, they penetrate the outer tissues and pass to the cortex, where they branch profusely. These hyphae may even pass to the wood of the young twigs, but the cortex appears to be the part which is materially injured.

Careful comparison of mycelia from different trees indicates that the 'thread-blight' is in all probability due to different fungi, in different localities.

'Thread-blight' occurs in India where, in addition to attacking the tea plant, it is known to be present on many wild trees.

The 'thread-blight' fungus of the tea plant is *Stilbum nanum*. Some of the fungi attacking the cacao tree are said to be Basidiomycetes, as clamp connexions have been observed in their mycelia, but they have not yet been identified.

Lewton-Brain. *West Ind. Bull.*, Vol. VI, p. 87.
Tropical Agriculturist, No. 25, 1905.
Stockdale. *West Ind. Bull.*, Vol. IX, p. 179.

(**Unidentified.**) (Root Disease of Cacao.)* In the islands of Dominica, St. Lucia and Grenada, cacao is often killed by a fungus which causes a disease of the roots. The disease usually spreads outwards in a circle from the tree first attacked and, if not attended to, may cause the death of a large number of trees. The branches are seen to wither from the tips, the leaves wilt and fall, the branches die, and subsequently, the whole tree may be killed. The fungus often starts by attacking the roots of trees which have been used for shade or as wind-belts, as for example, Pois-doux, bread-fruit, bread-nut, mango, pomme rose, and avocado pear. When the diseased roots are laid bare, they are found to be black and decayed, and white strands of mycelium are observed to be attached to them, which pass into the tissues of the roots. If the bark is peeled off, a white web of mycelium, arranged in somewhat star-like masses, can be seen between the bark and the wood. The mycelium is at first white, then grey, and finally brown. Clamp connexions have been occasionally observed in the mycelium, and recently a Basidiomycetous fructification has been discovered, which may prove to be that of the root disease. A similar disease attacks nutmegs in Grenada, and cacao and coffee in Jamaica.

Stockdale. *West Ind. Bull.*, Vol. IX, p. 179.

Uredinales.

Uredo arachidis, Lagh. (Ground nut Rust.) The leaves of the ground nut, or pea nut, are sometimes affected with this disease. The fungus was formerly described from Surinam, and has recently made its appearance in Dominica. Small, brownish spots appear on the under surface of attacked leaves.

Diagnosis :—

Sori small, on under side, scattered, surrounded by the ruptured epidermis, brown; uredospore ovoid-round, 24 – 30 *Microns* in diameter, epispore yellow.

Saccardo. *Syll.*, XIV, p. 394.

Uredo cannae, Winter. (Canna Rust.) The disease was first described from Brazil ; more recently it has made its appearance in Trinidad, where it has proved to be a destructive pest to cultivated cannas. Small, orange-coloured spots are formed on the leaves, which become discoloured and die.

Diagnosis :—

Sori generally hypophyllous, rarely also epiphyllous, without spots, either densely scattered over the entire surface or collected in groups, minute, pale-yellow, for a long time covered by the epidermis : spores variable in form, yellowish, echinulate, 25 – 45 x 16 – 23 *Microns.*

Trinidad Bull., Vol. III, p. 86.
Massee. *Text-book Plant Dis.*, p. 428.

Uredo gossypii, Lager. (Cotton Rust.) All green parts of the cotton plant seem to be affected by this fungus. It was first recorded in South America and has since been noticed in the West Indies. It has recently caused considerable damage to cotton in the United States of America. In the West Indies the disease hitherto does not seem to be dangerous.

On the upper surface of the leaf, small brown spots occur; they are roundish or angular in shape. The spores are produced in clusters mainly on the under side of the leaf; they break through the epidermis in the form of pustules.

Diagnosis :—

Sori formed below the epidermis, then bursting forth spores ovoid or pyriform 24-30 × 15-18 *Microns*; epispore equally thickened, pale-yellow, echinulate, paraphyses clavate.

Lagerheim. *Journ. Myc.*, Vol. VII, p. 48.
Lewton-Brain. *West Ind. Bull.*, Vol. VI, p. 117.

USTILAGINEAE.

Ustilago sacchari, Rabenh. (Sugar-cane Brand.) In Java this fungus has been reported to do serious damage to the sugar-cane. Mr. O. W. Barrett observed it in Trinidad where, however, it appeared to be limited to one or two plantations, and the extent of the damage done seemed to be of a less serious nature.

The leaves are the parts affected, and more especially the younger ones which have not yet separated from each other. The whole of these upper leaves is converted into a discoloured, projecting structure.

Diagnosis :—

Spore-mass black; spores globose or angularly globose, 8-18 *Microns* diam., olive-brown or rufous; epispore thick smooth.

Barrett. *Proc. Agric. Soc. of Trinidad and Tobago*, No. 252.
Wakker & Went. *De Ziekten van het Suikerriet op Java*, p. 24.

Graphiola phoenicis, Pait. (Date Palm Disease.) The fungus forms small, black spots on both sides of the leaves of the date palm (*Phoenix dactylifera*). The internal tissues of the leaves are in many cases much damaged.

Ann. Scienc. Nat. Botanique, 1824, p. 473.

FUNGI IMPERFECTI.

SPHAEROPSIDALES :—SPHAERIOIDACEAE.

Botryodiplodia sp. (Root Disease of Cocoa-nut.) The leaves first show signs of the disease; they become wilted and yellow at their tips. Finally they dry up, blacken and hang down.

Shedding of the affected leaves results; the leaf-base frequently remains attached to the tree, however. The nuts are shed in all stages, irrespective of size. The stem has a sour-smelling, red discoloration commencing at the level of the ground and extending upwards.

The roots, when examined microscopically, are seen to contain a mycelium composed of dark-coloured, septate hyphae, which run between and through the cells. All the tissues of the root appear to be attacked, including the xylem vessels. The disease seems to be but little investigated; it has been recorded to occur in Trinidad and British Guiana.

Stockdale. *West Ind. Bull.*, Vol. IX, p. 363.

Botryodiplodia diplocarpa, E & E.* Is reported as probably causing diseases of citrus trees in Trinidad. The fructifications of the fungus appear as black pustules under the bark.

Diplodia cacaoicola, P. Henn. (Die-back of Cacao, also Brown Rot of Cacao Pods.) This disease is known to occur in Dominica, St. Lucia and Grenada. The fungus causes considerable damage to cacao pods; a circular, brown patch appears on the pod and then extends over its surface. The rind and contents of the pod are completely destroyed. In many cases the brown patches appear at one or other end of the pod, but sometimes they may occur elsewhere, especially where the pod has been injured. The beans soon become attacked, and are rendered useless. At about the centre of the brown patch, small circular elevations occur; these are pycnidia, and are filled with a greyish-white dust, which after becomes dark-coloured. The fungus also attacks the branches of the tree.

On the stem of the sugar-cane, dark bodies sometimes make their appearance in the form of vertical lines; these bodies by their growth eventually rupture the rind of the cane. This is due to the formation of colonies of pycnidia under the rind, which later on become erumpent; the dark colour being caused by the presence of a dark-brown septate mycelium. Howard has carefully investigated the fungus and finds it to be identical with *Diplodia cacaoicola*, the 'die-back' fungus on cacao. This investigator was able to show that the fungus on cacao could be transferred to the sugar-cane and vice versa, so that on neither plant had the fungus become sufficiently closely adapted to the host to form a biological species.

Howard. *West Ind. Bull.*, Vol. II, p. 203.
F. C. von Faber. *Die Krankheiten und Parasiten des Kakaobaumes*, p. 28.

Diagnosis:—

Pycnidia scattered, in the cortex, innate, black; spores ellipsoid-oblong or sub-ovoid, 1-septate in the middle, hardly constricted, obtuse on both sides; loculi 1-guttulate, sooty black. Spores 22 – 18 x 12-14 *Microns.*

Botryodiplodia theobromae, Pat.,* has been described as occurring on cacao pods from Ecuador. The genera *Botryodiplodia* and *Diplodia* are distinguished from each other by the former possessing pycnidia in colonies produced on a stroma. Howard observes that, in the case of the West Indian fungus, there is a good deal of variation in the arrangement of the pycnidia and of the hyphae surrounding them, and he suggests that these two forms may be identical.

Howard. *Ann. Bot.*, XV, p. 683, pl. XXVII.
Engler & Prantl. *Die Nat. Pflanzenfam.* Fungi I, Teil I, *Abteilung*, p. 372.

Diplodia epicocos, Cooke. This was described as being parasitic on cocoa-nut in India ; the disease also occurs in Trinidad. The fungus attacks the leaves of the tree.

Diagnosis :—

Pycnidia scattered or almost gregarious, at length superficial or semi-immersed, globose, black ; spores elliptical 1-septate, constricted, brown, 22 x 10 – 12 *Microns*.

Cooke. *Grev.*, t 87, Fig 2.
Saccardo. *Syll.*, Vol. III, p. 372.

Diplodia sp. (A Pine-apple Disease.) This fungus, like *Trichosphaeria sacchari*, has been found to attack ripe pine-apples. It appears to effect an entrance at the cut end of the fruit-stalk, whence it passes up the central vascular core of the fruit and spreads to the surrounding pulp. The pulp of fruits which are attacked becomes soft and watery ; but the odour of ethyl acetate produced in the case of the *Trichosphaeria sacchari* disease does not occur. The older diseased parts become black ; this is due to the dark colour of the mycelium of the fungus. The pycnidia containing the spores by which the fungus reproduces itself occur as black dots under the rind.

Stockdale. *West Ind. Bull.*, Vol. VIII, p. 163.

Lasiodiplodia sp. is described by Mr. O. W. Barrett from Trinidad as being responsible for the greater amount of the damage done to cacao pods by fungus disease. The fungus infects the fruits and the cushions from which the fruit-stalks arise. The infected area on the pod is of a dull-brown colour. The mycelium of the fungus spreads from the shell of the pod to the pulp around the seeds, and then attacks the seeds themselves. Infection appears to start at the distal extremity of the pod more often than at the base.

[The same fungus or an allied species was found in Trinidad, Grenada and Dominica on pods of cacao by Mr. F. A. Stockdale, and also on the stems, branches and cushions. It frequently follows areas that had been previously affected with canker.

The fungus was shown by infection experiments to be a weak wound parasite, and its spread, as observed in Dominica, was probably slow, though the trees eventually died. In Trinidad, however, it is said to spread very fast in the tissues and to kill the trees very rapidly.

Stockdale. *West Ind. Bull.*, Vol. IX, p. 177. (F. W. S.)]

This disease has been reported to occur in San Domingo. The fungus in this case is thought to be *Lasiodiplodia tubericola*, but the species has not yet been identified with certainty. The fungus is also known to cause a disease of mango fruits in San Domingo.

Charles. *Journ. Myc.*, XII, 1906.
Barrett. *Agric. Soc. Proc., Trinidad and Tobago*, No. 280.

MELANCONIALES :—MELANCONIACEAE.

Gloeosporium ampelophagum, Sacc.* This fungus is the cause of Grape Rot and is common in Europe and America. It has been reported as occurring in St. Lucia.

Massee. *Text-book Plant Dis.*, p. 278.

Gloeosporium musarum, Cooke & Massee. (Banana Anthracnose.) A disease of ripe bananas was described from Brisbane as being caused by this fungus, and has since been recorded in the United States of America; there is no account of its occurrence in the West Indies, and a brief reference to it will, therefore, suffice. Black spots occur on the fruit and these gradually spread over its entire surface causing rotting to take place. When the spores of the fungus are extruded, a roseate tint is imparted to the spots.

Stoneman. *Bot. Gaz.*, Vol. XXVI, p. 69.
Massee. *Text-book Plant Dis.*, p. 287.

Colletotrichum Agaves, Cav.* This fungus causes a disease of the leaves of various species of Agave and is reported as occurring in Antigua. Spots are formed on the leaves which are darker in colour than the adjacent parts, and eventually turn brown or grey. The plants attacked finally die unless steps are taken to prevent the spread of the disease.

The spore-bearing pustules of the fungus appear on the diseased areas and occur as orange spots, frequently arranged in concentric rings. The fungus makes its entrance through the stomata or by means of wounds.

Diagnosis :—

Spots circular or elliptical, often becoming confluent, olive, changing to grey or brown; acervuli spherical to oblong, usually breaking through the epidermis of the host in concentric rings and ejecting orange-coloured masses of conidia; setae acute to blunt, light-brown, 3-5-septate, 110 to 170 *Microns* by 5-6 *Microns*; conidia oblong to cylindrical, hyaline, with one to two guttules, 16-31 x 5-6 *Microns*; conidiophores erect hyaline, usually simple, 6-7 *Microns* in diam., but very variable in length in different acervuli.

G. G. Hedgcock. *Sixteenth Ann. Rep., Missouri Bot. Gdn*, p. 153.

Colletotrichum Cradwickii, Bancroft. This fungus has recently been found on cacao pods from Jamaica and is considered to be a new species. The shell of the pods affected with the fungus were found to be quite hard. Yellow masses appear on the surface of the pod; these consist of conidiophores and setae, and become later pinkish in colour.

Diagnosis:—

Conidiophores hyaline, length at least greater than that of a spore; spores hyaline, pinkish in mass, elongated, with a slight constriction at the middle, without a central refringent portion, 14 – 17 x 5 *Microns*; setae straight, rigid, tapering, pointed, 2 – 3 times septate, purple, 70 – 100 *Microns* long by 4 – 5 *Microns* broad, on the average.

This species is distinguished from other species of *Colletotrichum* by the characters of the setae.

Five other species of *Colletotrichum* occur on cacao pods and may be mentioned here:—

Colletotrichum luxificum, van Hall and Drost.
„ *theobromae*, Apell and Stunk.
„ *theobromicolum*, Delacroix.
„ *brachytrichum*, Delacroix.
„ *incarnatum*, Zimmermann.

Colletotrichum falcatum, Went. (Red Rot of Sugarcane.) This disease has been reported from Hawaii, West Indies, Bengal, Madras, Java and Queensland. When a cane is attacked, the upper leaves lose colour and begin to drop; the third or fourth leaves from the unopened bud are usually first affected in this way. The leaf commences to wither at the tip and the withering extends down the margins; later on, the whole crown of leaves withers and drops. So that, as far as these primary symptoms are concerned, the cane appears to be suffering from excessive drought; if, however, the cane be split open, it can be seen to be reddened at one or two of the lower internodes. The discoloration appears as red dots or streaks in the vascular bundles; these extend so as to form blotches, and finally the interior of the cane becomes much reddened. Each red blotch has usually a white centre composed of dead cells. The reddening extends down into the stool and also towards the top of the cane. The cane becomes light and loses much of its juice; finally it turns dark in colour and the inside becomes deep-brown and crumbly. When one cane of a stool is affected, destruction of the whole stool usually follows. Infection appears to take place from below, i.e. either from the soil, or from the parent 'cutting'.

In some cases, the nodes in the middle of the cane may be the first to become infected; this differs from the above description in the point of attack. Again, the fungus may attack the roots of the cane or may also occur on the leaves.

The spores are produced on the surface of the cane at the nodes, or in sunken areas in the internodes. The fungus does not appear to produce spores abundantly. The conidiophores arise from a stroma, along with setae.

Diagnosis :—

Setae sometimes seriate, sometimes in a pseudo-conceptacle, dagger-shaped, 109 – 209 x 4 *Microns*, brown ; conidia sickle-shaped, 25 x 4 *Microns*, hyaline ; conidiophores ovoid, 20 x 8 *Microns*, hyaline or fuscous.

Went. *Mededeelingen van het Proefstation*, West Java, 1893.
Butler. *Memoirs Agric. Dept. in India*, Vol. I, No. 3.
Massee. 'Root Disease of Sugar-cane', *Kew Bulletin* No. 48, 1893.

Wakker & Went. *De Ziekten van het Suikerriet op Java*, p. 36.

Colletotrichum glœosporioides, Penzig.* (Wither Tip.) Spotting of the leaves and anthracnose of the fruit of various citrus trees are all due to this fungus. It occurs commonly in various parts of America, and has been found in Cuba and Jamaica.

The young leaves and shoots, when severely attacked, curl and dry up, and the fruit shows sunken, hard, brownish areas. The diseased areas on the leaves have a very definite margin, but on the fruit this is not so well marked. The spore-bearing pustules appear as small black dots arranged in concentric rings on the diseased surfaces. They are most numerous on the fruit, where they may even blacken the diseased surface almost completely. These pustules produce masses of minute, hyaline, cylindrical spores, which are rounded at both ends and contain two or more oil drops.

Diagnosis :—

Spots on the leaves amphigenous, pallid or greyish, with a definite, narrow, yellowish-brown border, mostly marginal, 1-4 cm. across, or extending along the entire margin of the leaf; acervuli amphigenous, black, subglobose, closely aggregated, sometimes confluent, covered by the cuticle, which is soon torn ; 175-240 *Microns* in diam. ; spores hyaline, oblong or cylindrical, mostly with two or three oil drops 16 – 18 × 4-6 *Microns*.

Hume. 'Anthracnose of the Pomelo', *Bull. No. 74, Florida Agric. Exp. Station.*

Rolfs. *Bull. 52, Bureau of Plant Industry*, U. S. D. A.

Colletotrichum gossypii, Southw. (Cotton Anthracnose.) The fruits, stem and leaves of the cotton plant are attacked by this fungus, but the most serious damage is done when it affects the fruits : a loss of as much as 50 per cent. of the crop has been recorded to be caused by the disease.

Minute, reddish-brown spots appear on the bolls ; these increase in size, and the inner part of each spot blackens, the margin remaining reddish-brown. Pustules appear in the centre of the spot and give it a grey or pink colour. Attacked fruits do not mature properly : they usually become dry and dead without opening, or may open only slightly at the top.

In some cases, the stems of seedlings are attacked, the fungus affecting that part of the stem just above ground, and the plant withers and dies as if it were 'damping off'. Such leaves as have become in some way weakened are those which are usually attacked. The cotyledons are sometimes affected, especially when they have become bruised or injured in some manner.

Diagnosis :—

Sori orbicular, dark-coloured or covered with a pink powder; acervuli erumpent; conidia irregularly oblong, hyaline, flesh-coloured in mass, 11 – 20 × 4·5 – 5·5 *Microns*; conidiophores colourless, at least longer than the conidium, 12 – 28 × 5 *Microns*; setae single or in tufts, blackish-brown at the base, almost hyaline at the apex, septate.

Atkinson. *Journ. Myc.*, Vol. VI, p. 173.
Southwell. *Journ. Myc.*, Vol. VI, p. 100.
Lewton-Brain. *West Ind. Bull.*, Vol. IV, p. 265.

Colletotrichum luxificum, van Hall & Drost. (Witches' Broom of Cacao.) The disease was reported to occur in Surinam in 1898, and in 1906 it was observed in cacao plantations in Demerara. Professor Ritzema Bos, of Amsterdam, concluded that the disease was caused by a fungus which he named *Exoascus theobromae*. No one else, however, had been able to find fructifications of the *Exoascus* type on the diseased parts, and quite recently Dr. C. van Hall and Mr. A. W. Drost have proved the disease to be caused by one of the Melanconiaceae, which they have named *Colletotrichum luxificum*.

When a tree is attacked by the fungus, hypertrophied shoots are produced in bunches, assuming the character of a 'witches' broom'; these branches are enlarged, show a tendency to grow vertically and have well-marked longitudinal furrows at their basal end. Finally, the whole structure thus formed dies. The inflorescence is also attacked, with the result that a dense mass of flowers is produced, this being due to the branching of many of the pedicels; the flowers in these clusters are usually abortive. The fungus has also been shown to be capable of infecting the fruits directly: such fruits as are attacked show a hardening of the tissues of the infected area, swelling of the fruit-stalks, and a blackening of the diseased patch. Pods which are diseased seldom mature, and a large quantity of them perish.

Diagnosis :—

Stromata isolated, forming small masses of a dirty white or sometimes of a rose colour; conidia continuous, hyaline, oval or ovoid, sometimes slightly constricted at the middle, 13-19 *Microns* long, 4-5 *Microns* broad, usually with a very refringent region at the centre of each; setae multi-septate, black or fuscous 50-120 *Microns* long, 3·5-4·5 *Microns* broad at the base, 1·2-2 *Microns* broad at the apex.

Hall & Drost. *Recueil des Trav. Bot. Néerl.*, *Soc. Bot. Néerl.* IV, p. 243 (1908).
Ritzema Bos. *Tydschrift over Plantenziekten*, p. 65, (1900).
Kew Bulletin, No. 5, 1909.
Howard. *West Ind. Bull.*, Vol. II, p. 205.

Pestalozzia palmarum, Cooke. (Cocoa-nut Leaf Disease.) This disease has been reported to occur in Trinidad and in Cuba. The fungus appears to be only a weak parasite. When the plant is attacked the leaves droop and the tips of the leaves die; yellowish spots appear on them and these frequently run together. The colour of the spots goes to a greyish-white with a greenish-brown margin. Finally, all the leaves become attacked, their internal tissues being destroyed. The leaf area of the plant is thus reduced and the plant is weakened, with the result that the yield of fruit is considerably diminished; the nuts produced are few and small.

Minute pustules of a dark grey colour are produced on the leaves, constituting the only known form of reproduction of the fungus.

Diagnosis :—

Erumpent, blackish, gregarious or scattered; conidia fusiform, 4-septate, blackish, stalk elongated, hyaline, 15 x 5-6 *Microns*.

Stockdale. *West Ind. Bull.*, Vol. VI, p. 313.
" " " " " IX, p. 371.
Cooke. *Grev.*, Vol. V, p. 102, pl. 86.

Septoria nicotianae. This fungus causes 'Frog-eye' disease of tobacco and is reported as occurring in Jamaica.

HYPHOMYCETES.

MUCEDINACEAE.

Pellicularia Koleroga, Cooke. (Coffee Leaf-rot.) The disease was first noticed in Mysore, Southern India, where it was known as 'leaf-rot' or 'Koleroga'; later on Dr. Ernst found it to occur in Venezuela, and more recently it has made its appearance in Jamaica. [It has also been reported as occurring on the leaves and small branches of cacao in Trinidad. (F.W.S.)]

The fungus covers the leaf with a slimy gelatinous matter, and the mycelium is external to the host. Affected leaves turn black, rot at their tips, and fall off.

Diagnosis :—

Effuse, greyish-white, covering the whole leaf-surface; conidia globose, hyaline, echinulate, 7·5 *Microns* diam., inserted laterally, sessile.

Saccardo, Vol. IV, p. 149.
Kew Bulletin, 1893, p. 67.
Cooke. *Coffee Diseases.*
Hart. *West Ind. Com. Circular*, Vol. XXIV, p. 510.

Ramularia areola, Atkinson. (Areolate Mildew of Cotton.) The fungus attacks the leaves of the cotton plant; it seems, however, only to damage older leaves, and is not very important. Definite, small areas of the leaf become diseased; these areas are bounded by the veins and appear yellowish and frosted.

Diagnosis :—

Spots on under side of leaf, rarely on both, at first pale, then darker in colour, 1-10 mm. broad, irregular, bounded by veins of the leaf; hyphae in small fascicles, many-septate, hyaline, 25-75 x 4·5-7 *Microns*; conidia oblong, 1-3-septate, formed in chains at first, 14-30 x 4-5 *Microns*.

Lewton Brain. *West. Ind. Bull.*, Vol. IV, p. 63.
Stockdale. *West Ind. Bull*, Vol. VIII, p. 159.

Ramularia necator, Massee.* This fungus developed on the cotyledons of seedling cacao from Dominica and Jamaica, when the seeds were planted at Kew. The fungus was shown to have come from the West Indies. It resulted in the death of the plants attacked.

Diagnosis :—

Sporodochia superficial, broadly effuse, filamentous white; sterile hyphae creeping, densely interwoven, septate, hyaline, 7-10 *Microns* wide, slightly swollen here and there. Basidia erect, sparsely branched, the ultimate branches attenuate, conidia elliptico-oblong, rounded at either end, 3-septate, scarcely constricted at the septa, 25-28 x 7-9 *Microns*.

Massee. *Kew Bull.*, 1907, pp. 243 and 298.

DEMATIACEAE.

Cercospora coffeicola, B. and C. Has been reported to occur on coffee leaves in Trinidad.

Diagnosis :—

Spots amphigenous, 2-3 mm. in diameter, light-coloured or white in the centre with a reddish-brown margin; hyphae mostly epiphyllous, tufted on the small tubercular base, 50-75 x 4 *Microns*, 2-3-septate, fuscous, butalso elongated to 100 or 350 *Microns*, nodulose and toothed above; conidia hyaline, 2-4-septate, 75 x 3 *Microns* at the thickest end.
Journ. Myc., Vol. IV, p. 5.

Cercospora gossypina, Cooke. (Leaf-spot of Cotton.) This disease is known as 'black-rust' in the United States of America; it frequently occurs along with the cotton anthracnose. Dark-coloured spots are produced on the leaves, the centres of the spots later becoming lighter in colour and bearing the spores of the fungus. The fungus seems to be of little practical importance in the West Indies.

Diagnosis :—

Hyphae almost fasciculate, elongated, dark-coloured; conidia elongated, five-to seven-times septate, hyaline 70 – 100 × 3 *Microns*.

Cooke. *Grev.* XII, p. 31.
Lewton-Brain. *West Ind. Bull.*, Vol. VI, p. 120.
Bot. Gaz., p. 61, 1891.

Cercospora personata, Ellis. (Leaf-spot of Ground Nut.) This disease has recently occurred in Dominica. The fungus forms brown, almost circular spots on the under surface of the leaves, about 2-4 mm. in diameter.

Diagnosis —

Hyphae densely caespitose, short, brown, continuous; conidia clavate, pale-brown, 3-septate, 30-50 x 5-6 *Microns*.

Ellis. *Journ. Myc.*, 1885.

Cercospora vaginae, Kr. (Red Spot of Sugar-cane). This disease occurs in the West Indies, India and Java. The fungus causes large, red spots to form on the leaf-stalk, the spots being confided to the leaf-stalk only.

Several other species of *Cercospora* occur on the sugar-cane :—

C. sacchari, Breda de Hann. (Eye-spot of Java.)
C. Köpkëi, Kr. (Red Leaf-spot of Java.)
C. acerosum, D and H. (Black Spot of Java.)
C. longipes, Butler. (Brown Leaf-spot of Bengal.)
Butler. *Memoirs Agric. Dept. in India*, Vol., I, No. 3.

Cladosporium elegans, Penzig. (Disease of Orange.) In addition to the orange, the fungus attacks various citrus trees. It has proved to be injurious in the Southern States of America and in Cuba, as well as in Southern Europe.

The disease appears as white or cream-coloured spots on the leaves, young twigs and fruit. When the leaves are badly attacked, they become curled and are covered with wart-like eruptions.

Diagnosis :—

Tufts epiphyllous, gregarious, distinct, seated on arid spots; conidiophores erect, fasiculate, simple, sparingly septate, distinctly sinuous, brown, 160-200 x 5-6 *Microns*; conidia apical and lateral, continuous or 1-septate, elliptic-oblong, epispore delicately granulated, pale-brown or yellowish, 18-20 x 5-6 *Microns*.

Cooke and Horn. *Bull. 9, Estacion Central Agron. de Cuba.*
Massee. *Text-book Plant Dis.* p. 436.
Tubeuf & Smith. *Diseases of Plants*, p. 509.

Thielaviopsis ethaceticus, Went. This fungus causes a disease of sugar-cane cuttings, known as the 'pine-apple disease'. The same fungus has been described as attacking pine-apple fruits in Hawaii.

The disease causes great damage in a dry season, when germination and growth are slow. The fungus effects an entrance at the cut ends of the cutting, as a rule, but it can enter at any wounded surface. The mycelium pervades the tissues of the stem, and the interior of diseased stems, on examination, is found to contain a black mass of hyphae and spores, and has an odour of pine-apple. The growth of the cutting is checked, and the plant finally dies.

Diagnosis :—

Sterile hyphae almost hyaline; fertile hyphae simple and septate : conidia of two kinds, the macroconidia ovate and blackish, the microconidia hyaline and cylindrical, originating within the ruptured apex of a hypha.
Macroconidia 16 – 19 × 10 – 12 *Microns.*
Microconidia 10 – 15 × 3·5 – 5 *Microns.*

Lewton-Brain. *West. Ind. Bull.*, Vol. VI.
Went. *Archief voor de Java Suikerindustrie*, 1893.

(**Unidentified.**) (Leaf Mildew of Cotton.) The leaves of the cotton plant sometimes turn yellow or red in irregular areas, and finally the whole leaf becomes yellow and falls off. The disease was said to be serious in Montserrat in 1904. Little or no work seems to have been done on it, and the fungus is at present unnamed.

(**Unidentified.**) (Pine-apple Blight.) This disease, although hitherto not yet fully investigated, seems to be due to a fungus which is parasitic on the roots of the pine-apple plant. In the incipient stages of the disease the tips of the leaves become withered and of a yellow colour ; this discoloration extends further, and most of the leaves are found to have lost their turgidity and to have become withered. The plant eventually dies, the apical leaves and shoots becoming decayed at their bases of attachment and dropping off. If these plants bear fruits, they are usually stunted, and become yellow some time before the proper time of ripening. The tips of the roots and rootlets, on examination, are seen to be discoloured and flaccid, instead of maintaining their usual turgidity, and in many cases the roots are quite black and rotten. Numbers of root-hairs occur on the older parts of the roots, where they are normally absent. The root-hairs and tissues of the root contain abundant fungus mycelium, and it seems as if the abnormal formation of root-hairs on the older parts of the roots was an effort on the part of the roots to replace those hairs destroyed by the fungus. Finally the roots become decayed and rotten, and the decay can be traced upwards into the stem. The fungus has not yet been identified, and apparently no experiments have been conducted with a view to ascertaining whether or not it is the cause of the disease.

Stockdale. *West Ind. Bull.*, Vol. VIII, p. 159.
Lewton-Brain *West Ind. Bull.*, Vol. VI, p. 120.

(**Unidentified.**)* (Root-rot of Cassava and Logwood.) A white mycelium attacking the roots of logwood trees was

found in Jamaica by Professor F. S. Earle, who was of the opinion that it belonged to some member of the Hymenomycetes.

The fungus caused the death of the trees and then spread outwards in a circle underground, affecting fresh healthy trees. Cassava plants growing in the neighbourhood of dead logwood trees also showed a similar disease.

West Ind. Bull., Vol. IV, pp. 2 and 8.

APPENDIX I.

A. DISEASES ASCRIBED TO BACTERIA.

ANGULAR LEAF SPOT OF COTTON. The disease appears as small angular spots on the leaves, which are usually bounded by the smaller veins. The spots are at first of a watery appearance, but later turn light-brown and black.

Frequently the spots form dark lines along the main veins an inch or more long and ¼-inch wide.

The disease is due to a bacterium, *Pseudomonas malvacearum*. It is not of much importance, except in rare instances.

Lewton-Brain. *West Ind. Bull.*, Vol. IV, p. 345.
Atkinson. *The Cotton Plant*, p. 286.

COTTON BOLL ROT. The rot begins within the boll as a small dark-brown area, which includes the young seeds, starting at a point near the point of attachment of the boll to the stalk. The rot spreads throughout the contents of the boll, and when they are all decayed, attacks the outside of the boll itself. When the disease affects a young boll, the decay is complete, and the boll does not open; but when it develops on an older boll, only a small part of the lint is affected and the boll opens.

The disease has been shown to be due to a bacterium, *Bacillus gossypinus*, but the method of infection has not yet been definitely ascertained.

Lewton-Brain. *West Ind. Bull.*, Vol. IV, pp. 265 and 345.
Atkinson. *The Cotton Plant*, p. 310.

BLACK BOLL OF COTTON. This disease appears to be characterized by decay of the internal parts of the boll, usually starting at the base, while the outside is apparently healthy. The seeds swell up inside during the latter stages, probably owing to a form of premature germination, and all the lint is destroyed. The bolls, as a rule, drop from the plant before opening. Such bolls, instead of being oval, are practically spherical, and taper very suddenly to a sharp point; they are also more resistant to pressure than normal bolls. Occasionally they dry up on the plant and open slightly. When this is the case, they are easily distinguishable from bolls which have dried physiologically, by the condition of the lint.

A short, non-motile, rod-like bacillus is the only organism that has been found in connexion with the disease, though it has not been definitely proved that this is the cause, as inoculation experiments have not been carried out. Climatic and soil conditions do not appear to exercise any influence on the disease, which occurs on various soils both in Montserrat and Antigua.

Lewton-Brain. *West Ind. Bull.*, Vol. VI, p. 119.

BANANA LEAF-BLIGHT. The disease first appears in the form of a browning of the vascular bundles of the leaves. This is soon followed by a blackening of the entire leaf-blade and the decay of the leaf and petiole. The terminal bud remains free from disease, but the new leaves which it puts out are attacked in turn, so that only three or four healthy leaves are left. Infected plants are much stunted in growth and do not bear fruit. Professor Earle attributes the disease to bacteria. It was first found in Jamaica.

Earle. *West Ind. Bull.*, Vol. IV, p. 6.

BUD-ROT OF COCOA-NUT PALMS. The first symptoms of this disease are the yellowing and dropping of the outer leaves, followed closely by dropping of the nuts. Finally the whole of the terminal bud becomes converted into a putrefying mass with a very unpleasant sour smell, and the tree is completely killed.

Numerous fungi and bacteria have been found in connexion with this disease, but at present none of them has been definitely proved to be the cause, though the smell of putrefactive fermentation seems to indicate a bacterial origin.

The disease is of serious dimensions in the West Indies, and occurs in Jamaica, British Honduras and Cuba, and more recently has been found in Trinidad and British Guiana. A disease which appears to be very simllar in its symptoms has also been found to occur in various parts of the eastern hemisphere.

West Ind. Bull., Vol. VI, p. 307 where numerous additional references to the chief papers dealing with the subject will also be found.

GENERAL. Root diseases of arrowroot, eschalots, ginger, potatos and yams have been reported from various islands, as well as diseases affecting cabbage leaves and tomato fruits, and are attributed to bacteria. The diseases are of minor importance in most cases, and their complete investigation and identification have not yet been undertaken.

B. DISEASES DUE TO PHYSIOLOGICAL CAUSES.

SHEDDING OF COTTON BOLLS. The fruits and fruit-stalks first become of a paler colour than the healthy parts, and eventually either fall completely, or hang by a few threads. This is not due to any definite organism but to general physiological

conditions in the plant caused by unfavourable conditions, such as a sudden change from wet to dry weather, or the reverse.

Atkinson. 'Some Diseases of Cotton', *Alabama College Station Bulletin, No. 41.*

Lewton-Brain. *West Ind. Bull.*, Vol. IV, pp. 264 and 346.

MAL-DI-GOMMA OF THE ORANGE. This disease, also known as 'Foot Rot', is fairly common in several countries, especially in Florida, U. S. A. It has also been found in Jamaica and Cuba. The first symptom of the disease is an abundant exudation of drops of gum on the trunk of the tree near the base. Then the inner bark becomes soft and has an unpleasant odour, while the outer bark splits away. The cambium under the diseased spot is killed, and finally the bark dries up and splits off.

The disease spreads to the crown and main roots, and in severe cases girdles the tree and kills it in about two years. In mild cases the tree may recover. The bark is only destroyed for 1½ feet above the ground, but on the main roots the disease extends further. Diseased trees have the appearance of suffering from lack of nourishment.

No definite organism has been found in connexion with early stages of this disease, but recently it has been shown that gumming diseases in general are mainly due to physiological conditions, such as excessive irrigation or drought, or imperfect aeration of the roots, and similar causes; and at present it seems probable that Mal-di-Gomma is also attributable to these.

Swingle and Webber. 'The Principal Diseases of Citrous Fruits in Florida', *Bull. No. 8., U. S. Depart. Agric. Div. of Veg. Phys. and Path.*

Smith and Butler. 'Gum Diseases of Citrous Trees in California', *Bull. No. 200., Agric. Exp. Sta.*, California.

MELANOSE. This disease occurs as small dark-brown spots on the leaves, stems and fruits of various citrus trees in America, it has also been found in Montserrat.

The spots increase in size, and may split in the centres. Many of the leaves fall, and the branches become twisted and contorted, in severe attacks; consequently the health of the trees is considerably impaired, while the fruit is rendered worthless for market purposes.

No living organism has ever yet been found in connexion with the disease, which must therefore be attributed to physiological causes. The latter, however, do not seem satisfactorily to account for it, as it will yield to the application of fungicides, and seems to be infectious, generally spreading in the direction of the prevailing wind.

Swingle and Webber. 'The Principal Disease of Citrous fruits in Florida', *Bull. No. 8., Div. of Veg. Phys. and Path.*, U. S. Dept. of Agric.

PINE-APPLE TANGLE ROOT. The leaves of pine-apples turn yellow, then wilt and dry up. The roots exhibit a peculiar appearance, being wound round and round the plant under the leaves and forming a tangled mass.

The disease is due to improper preparation of the land before planting, which prevents the roots from entering the ground freely. Consequently they wind round the plant, and strangle it.

The disease has been observed in Dominica, Antigua and Jamaica, as well as in other parts of the world.

Stockdale. *West Ind. Bull.*, Vol. VIII, p. 58.

APPENDIX II.

A. TRICHOSPHAERIA SACCHARI, MASSEE, AND THIELAVIOPSIS ETHACETICUS, WENT.

Two forms of fruiting body, namely, the ascigerous stage and the *Melanconium* stage, have for some time been recognized as belonging to *Trichosphaeria sacchari*. Besides these, Massee [5] states that an endospore condition consisting of macro- and micro-conidia very frequently developed in pure cultures of the *Melanconium* fungus in the Laboratory at Kew. Prillieux and Delacroix [6] confirm this, and more recently Lewton-Brain [3] has also obtained them in Hawaii. But Howard [8], Went [9] and Butler [1], here, in Java, and in Bengal have not been able to obtain them, probably owing, as Thiselton Dyer [8] suggests, to the difference of temperature conditions.

There appears to be no reason for doubting that this fungus has an endoconidial stage; but it does seem inadvisable to assume with Massee [4], and Prillieux and Delacroix [6] that the endospore condition of *Trichosphaeria sacchari* is identical with *Thielaviopsis ethaceticus*, Went, the fungus causing 'Pine-apple disease' of sugar-cane cuttings. Went [9] also claimed that the endospore condition obtained in Massee's cultures of *Melanconium* spores, was the same as *Thielaviopsis ethaceticus*, but that it was present as an impurity in the culture. Subsequent cultures from single spores of *Melanconium* have proved that this is not the case.

Butler has shown that a fungus occurring on cane cuttings to which he gave the name *Sphaeronema adiposum* is also capable of forming endospores, and suggests that possibly these may be identical with the 'pine-apple' disease; but he adds that several other fungi can form endospores, and that the 'pine-apple' fungus which he grew for a considerable period on various media never gave him any other spore-forms than the macro- and micro-conidia.

The arguments in favour of the idea that *Thielaviopsis ethaceticus* is identical with the endoconidial stage of *Trichosphaeria sacchari* may be summarized as follows:—

(1) As shown by Massee[5], *Trichosphaeria sacchari* forms endoconidia in cultures, which closely resemble those of *Thielaviopsis ethaceticus.*

(2) The two fungi in question have been found in the same sugar-cane.

(3) Howard [2] reports that *Thielaviopsis* occurred in diseased pine-apples in Antigua, and Stockdale [7] reports that *Trichosphaeria* occurs there also, causing a smell of ethyl acetate.

(4) Lewton-Brain[3], while refraining from the expression of any definite opinion, remarks that the identity of the two forms would make it a simpler matter to account for the prevalence of *Thielaviopsis ethaceticus.*

The arguments that oppose these are :—

(1) The occurrence of an endoconidial stage of *Sphaeronema adiposum* and several other fungi as mentioned by Butler[1].

(2) The fact that pure cultures of *Thielaviopsis ethaceticus* have not yet been found to produce any spore-forms other than the endoconidia.

(3) The 'Pine-apple disease' of cane cuttings first arose in Java, where *Trichosphaeria sacchari* is very seldom found, and then only on dead canes[8].

(4) The name 'Pine-apple disease' was given to the effect of *Thielaviopsis ethaceticus* owing to the smell of pine-apple which accompanies it. This smell is a very constant character and is not caused by the mycelium of *Trichosphaeria sacchari.*

Consequently it seems advisable not to definitely identify *Thielaviopsis ethaceticus* with the endoconidial stage of *Trichosphaeria sacchari* in the present stage of our knowledge; although the formation of endoconidia by the latter fungus must be considered as proved. This course has therefore been adopted in Mr. Bancroft's paper

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2. Howard.—*West Indian Bulletin,* III, p. 74.
3. Lewton-Brain.—*Bulletin of Experiment Station,* No. 7, Hawaiian Sugar Planters' Association.
4. Massee.—*Kew Bulletin,* 1904.
5. „ *Ann. Bot.* VII.
6. Prillieux and Delacroix.—*Bulletin Soc. Myc. de France,* XI, pp. 81 and 82.
7. Stockdale.—*West Indian Bulletin,* VIII, p. 163.
8. Thiselton Dyer.—*West Indian Bulletin,* II, p. 211.
9. Went.—*Ann. Bot.* X, pp. 583-600.

B. THE NOMENCLATURE OF THE GENUS DIPLODIA AND ITS ALLIES.

This group of fungi comprises several important diseases f plants in the tropics, as certain of its members occur on cacao, cocoa-nut palms, and one or two rubber-yielding trees, in addition to mangos and citrus trees.

The group is divided up into several genera in accordance with the following characters:—

Those fungi in which the pycnidia are always isolated, and without a stroma, belong to the genera *Diplodia*, *Microdiplodia*, *Macrodiplodia*, *Chaetodiplodia*, etc.; while those with pycnidia occurring in groups on a stroma, belong to the genera *Botryodiplodia*, and *Lasiodiplodia*. These last two genera are separated by the facts that in the genus *Botryodiplodia* the stroma is smooth and the pycnidia are without paraphyses, while in that of *Lasiodiplodia* the stroma is covered with a soft felt of hairs, and the pycnidia contain paraphyses. These, then, are the theoretical lines on which the genera are separated. Unfortunately, none of the characters mentioned are truly fixed, with the exception of the presence or absence of paraphyses in the pycnidia. Certain fungi in this group may individually show some or all of them, according to the position of the fructifications on the host plant, and the depth within the tissues at which they are formed. As may be readily understood, the variability of the characters upon which the divisions between the genera are based has caused a considerable amount of confusion in the nomenclature, besides a serious multiplication of names for the same fungus. This has a practical bearing of some importance, in addition to its rather academic one, as it prevents the recognition of the very general occurrence of one or two of these species in the tropics, and the large variety of host plants which they can attack.

An instance of this is the fungus known in the publications of this Department as *Diplodia cacaoicola*, Henn. It has been shown by Howard [3] that this fungus attacks both cacao and sugar, on the former of which it causes 'Die-back' of the branches and 'Brown rot' of the pods. On the young branches of cacao it forms fructifications that are more usually isolated, but contain paraphyses: and on the strength of these characters it was identified with *Diplodia cacaoicola*, Henn. On older branches and the main stem, however, the fructifications are more usually grouped in a stroma and are generally covered with a velvety layer of hairs. On this account, Patouillard and Lagerheim claim that it is identical with *Botryodiplodia theobromae*, Pat., while Butler [2], in discussing specimens found on sugar-cane, remarks that it is more properly a species of *Botryodiplodia*. But these authors all overlook the presence of the paraphyses in the pycnidia, on account of which the fungus must be regarded as a *Lasiodiplodia*. These points are all clearly indicated by Griffon and Maublanc [4] in the *Bulletin de la Société Mycologique de France*, Tome XXV, 1er Fasicule in an article entitled 'Sur une Maladie du Cacaoyer'. These

authors describe the same fungus from the French Congo and point out that it is, according to the present system of classification, a *Lasiodiplodia*, and that the various names mentioned above have all been given to the same fungus, the correct name of which is *Lasiodiplodia theobromae*, Griff. and Maubl. Their statements are for the most part based on comparisons of different specimens, and recent observations made in the laboratory of the Imperial Department of Agriculture confirm them.

Another species of fungus was described by Stockdale [10] as attacking the stems and roots of cacao in the West Indies, to which the name *Lasiodiplodia* sp. has been given. The appearance of this agrees exactly with the description of the form of fructification occurring on roots and main stems of cacao attacked by *Lasiodiplodia theobromae* as described by Griffon and Maublanc, and also by Maublanc [7] alone. Further it has lately been found here on a specimen of cacao whose twigs showed typical symptoms of 'Die-back', while the older branches and stem showed every transition between the pycnidia typical of *Diplodia*, that is they were characteristically isolated, and those typical of *Lasiodiplodia*, that is in a stroma covered with hairs. The pycnidia, whether isolated or not, always contained exactly identical spores and paraphyses, and the former even often showed a few hairs round the ostiole. Consequently it seems that the disease of the stem and roots, and that on the twigs and pods are identical, and due to one fungus, *Lasiodiplodia theobromae*, and not to two distinct species, *Diplodia cacaoicola* and *Lasiodiplodia* sp., as was formerly considered to be the case.

The form known in the publications of this Department as *Lasiodiplodia* sp. was identified in America and considered to be the same as that described by Charles [3] as occurring on cacao and the mango in San Domingo. As a result, the fungus described by Charles must be considered to have been *Lasiodiplodia theobromae*; and this was believed to be the case by Griffon and Maublanc. These authors also point out that the form described by Appel and Laubert [1] as *Lasiodiplodia nigra*, found on cacao in Samoa, is probably the same as *Lasiodiplodia theobromae*. The same authors found this fungus on *Albizzia moluccana* in Madagascar, and recent observations would seem to indicate that it may occur on other host plants than sugar and cacao in the West Indies. The recognition of the wide distribution of this fungus, and the variety of host plants which it can attack, are of considerable importance when dealing with the fungus from an economic point of view.

To summarize:—

(1) The fungus known as *Diplodia cacaoicola*, Henn., is more properly called *Lasiodiplodia theobromae*, Griff. and Maubl.

(2) The one fungus *Lasiodiplodia theobromae* is responsible for 'Brown rot' of cacao pods, 'Die-back' of twigs, and the stem and root disease of cacao formerly attributed to *Lasiodiplodia* sp.

(3) The synonyms of *Lasiodiplodia theobromae*, Gr ff. and Maubl. are *Macrophoma vestita*, Prill. and Del. [9]
Diplodia cacaoicola, Henn.
Botryodiplodia theobromae, Pat.
Lasiodiplodia sp., and in all probability
Lasiodiplodia nigra, Appel and Laub.

(4) In addition to cacao, the fungus can attack sugar-cane, mangos, and *Albizzia moluccana*.

(5) From what has been said, it seems sufficiently evident that the whole group is in great need of careful revision, the divisions being based on characters which are as constant as possible and independent of the position on the host and the depth within its tissues at which the pycnidia are borne. Furthermore, this revision is one of considerable importance from the economic point of view.

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4.—Griffon and Maublanc. *Bull. Soc. Myc. de France* XXV, pp. 51-8.

5.—Howard. *Anns. Bot.*, XV.

6.— „ *West Ind. Bull.*, II, No. 3.

7.—Maublanc. *L' Agriculture Pratique des Pays Chauds*, 1909, No. 79.

8.—Patouillard and Lagerheim. *Bull. Soc. Myc. de France*, VIII, p. 136.

9.—Prillieux and Delacroix. „ „ 1894, p. 165.

10.—Stockdale. *West Ind. Bull.*, IX, p. 177.

[While this paper was in the press *Bulletin* No. 21 of the Department of Agriculture in Surinam, by A. E. van Hall and A. W. Drost, was received at the office. The results arrived at by these observers substantially support what has been said above, but they suggest the abolition of the genus *Lasiodiplodia* on the ground that the characters separating it from *Diplodia* are not constant. Consequently they retain the old name *Diplodia cacaoicola* instead of *Lasiodiplodia theobromae*. F.W.S.]

APPENDIX III.

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FIG. 20.—SPHAEROSTILBE FLAVIDUM, Massee.
(Kindly lent by H.M. Stationery Office.)

1. Leaf of coffee plant, shewing the circular whitish patches.
2. Hyphae with swollen heads on surface of a patch.
3. A group of such hyphae.
4. Two hyphae forming conidia from their swollen heads.
5. Fertile hyphae and perithecia
6. Two perithecia.
7. An ascus with spores.

(After Massee.)

MANURIAL EXPERIMENTS WITH COTTON IN THE LEEWARD ISLANDS.

BY H. A. TEMPANY, B.Sc., (Lond.), F.I.C., F.C.S.,
Government Chemist and Superintendent of Agriculture for the Leeward Islands.

Since 1904-5, manurial experiments with cotton have been carried out in the Leeward Islands. The results for this and the following year, only, were published in the *West Indian Bulletin*, Vol. VI, p. 247 : and Vol. VII, p. 283. Similar experiments have, however, continuously been carried out, and the following is an account of the results obtained during the past year. The original series consisted of thirty-eight experiments. The nature of the manurial treatment will be found by reference to the tables which follow. During the past season, these thirty-eight experiments were carried out in triplicate at the experiment station at La Guérite, St. Kitts, and experiments 1 to 34 on single plots on Dagenham estate, Montserrat. The results obtained in each case are given in Table I.

Of the trials at La Guérite, the nitrogen and phosphate series were planted in June and July, respectively, while the potash series was planted in August. Commenting on these results, Mr. F. R. Shepherd, Agricultural Superintendent of the Botanic Station, St. Kitts, now says :—

'The no-manure plot (No. 1 this season in the nitrogen series) is slightly below the average of previous years, but in the phosphate and potash series, it is again well up to the average of the manured plots. The influence and action of the manures again this year have shown no marked difference on the yield of cotton, except in one or two individual cases.

'Taking the results on the average of five years, the no-manure plot occupies a high position, being 77 ℔. beyond the mean of all the thirty-five plots under experiment, the no-manure plot giving an average of 1,310 ℔. per acre, and the mean of all the plots being 1,241 ℔.

'Considering these results on this basis, it seems clear that on this land, and under these conditions, the use of artificial and other manures is not remunerative, but that good tilth and soil conditions, with average seasons, are more likely to influence the yield of cotton than manure.

'It may be interesting to mention that, in addition to the two no-manure plots under experiment, there were also five other plots of the same size which have been dealt with in a similar manner each year, and the average yield of seed-cotton from these for the five years is 1,160 ℔. per acre.'

In Montserrat, experiments Nos. 1 to 24, only, were carried out, there being no cotton seed meal, or salt and sulphate of copper series. The yields obtained from all the plots were large; in the case of some of them, appreciable increases are shown : the plots which yielded these were Nos. 2, 7, 9 and 15. The largest return was given by plot 9, in which 20 ℔. of nitrogen was applied as sulphate of ammonia, alone, the increase being 312 ℔. of seed-cotton.

TABLE

MANURES AND YIELDS

No. of Experiment.	Nitrogen as nitrate of soda.	Nitrogen as sulphate of ammonia.	Potash as sulphate of potash.	Phosphoric acid as basic phosphate.	Cotton seed meal.	Salt.
1	...	...	No manure		...	...
2	...	...	Pen manure		...	...
Nitrogen Series						
3	...	...	30	40	...	...
4	...	20	30	40	...	...
5	..	30	30	40	...	...
6	20	...	30	40	...	...
7	30	...	30	40	...	...
8	...	30	30	..	...	...
9	..	20	...	...	...	..
10	..	30	...	...	..	...
11	20	...	...	...	...	...
12	30	...	...	...	...	..
Phosphate Series						
13	...	30	30	...	...	...
14	...	30	30	40	...	...
15	...	30	30	60	.	..
16	...	30	30	80	...	...
17	...	..	...	40	...	...
18	...	30	30	40*	...	...
19	...	30	30	60*	...	...
Potash Series						
20	...	30	...	40	...	...
21	...	30	20	40	...	...
22	...	30	30	40	...	...
23	...	30	40	40	...	...
24	...	...	40	...	...	...
Cotton Seed Meal Series						
25	...	...	...	...	300	...
26	...	...	..	...	600	...
27	...	...	30	...	300	...
28	...	...	...	40	300	...
29	...	...	30	40	300	...
30	...	30	30	40	300	...
Salt Series						
31	...	...	...	...	...	100
32	...	...	...	...	...	200
33	...	30	30	40	...	100
34	...	30	30	40	...	200
35	...	...	...	...	300	100
Sulph. of Copper Series						
36	...	...	...	...	...	...
37	. .	30	30	40	...	...
38	.	...	...	...	300	...

* Phosphoric acid as superphosphate.

I.

IN POUNDS PER ACRE, 1909.

Sulphate of copper	La Guérite. I	La Guérite. II	La Guérite. III	Montserrat.	Average.	Difference on No manure.
...	1,000	1,042	830	1,605	1,119	...
...	1,225	900	765	1,825	1,179	+ 60
...	1,200	852	927	1,587	1,142	+ 23
...	1,030	900	730	1,545	1,051	− 68
..	1,190	835	855	1,680	1,140	+ 21
..	1,085	755	745	1,610	1,049	− 70
...	1,285	760	810	1,872	1,182	+ 63
...	1,372	630	670	1,702	1,094	− 25
...	1,250	760	807	1,917	1,184	+ 65
...	1,310	1,035	865	1,665	1,219	+100
...	1,380	940	687	1,647	1,164	+ 45
...	1,140	935	762	1,647	1,121	+ 2
...	1,372	630	670	1,702	1,094	− 25
...	1,190	835	855	1,680	1,140	+ 21
...	1,350	825	800	1,752	1,182	+ 63
..	1,297	1,122	635	1,717	1,193	+ 74
...	1,115	1,175	952	1,642	1,221	+102
...	1,435	975	715	1,492	1,154	+ 35
...	1,202	720	890	1,412	1,056	− 63
...	972	1,076	915	1,595	1,139	+ 20
...	820	895	790	1,397	976	−143
...	1,190	835	855	1,680	1,140	+ 21
...	917	1,025	850	1,610	1,101	− 18
...	1,235	935	850	1,602	1,156	+ 37
..	1,330	1,175	892	..	1,132	+ 13
..	1,095	905	857	...	952	−167
...	1,180	932	820	...	977	−132
...	1,358	865	900	..	1,041	− 78
...	1,047	1,070	940	...	1,019	−100
...	922	950	670	...	847	−272
...	740	685	830	...	752	−367
...	1,025	1,112	805	...	981	−138
..	920	1,015	850	...	928	−181
...	890	850	940	...	893	−216
...	985	1,015	895	...	965	−154
20	565	1,145	970	...	893	−226
20	915	930	1,150	...	982	−137
20	995	1,150	1,030	...	1,058	− 61

TABLE II.

Manures and Yields in Pounds per Acre.

Mean of five years—33 plots.

No. of Experiment.	Nitrogen as nitrate of soda.	Nitrogen as sulphate of ammonia.	Potash as sulphate of potash.	Phosphoric acid as basic phosphate	Cotton seed meal.	Salt.	Sulphate of copper.*	Seed-cotton.	Difference on No manure.
1	...	..	No manure		...	...	...	898·0	...
2	...	...	Pen manure		.	...	...	933·3	+ 35·3
Nitrogen Series.									
3	..	...	30	40	.	.	...	895·5	− 2·5
4	...	20	30	40	...	...		906·1	+ 8·1
5	..	30	30	40	...	...	...	951·3	+ 53·3
6	20	...	30	40	..	...	...	899·6	+ 1·6
7	30	..	30	40	...	...	...	893·4	4·6
8	.	30	30	.	...	...	...	924·1	− 26·1
9	..	20	...	...	...	...	...	845·5	+ 52·5
10	...	30	...	...	..	...	...	954·7	+ 56·7
11	20	...	...	...	...	...	.	945·7	+ 47·7
12	30	...	...	..	...	...	..	910·0	+ 12·0
Phosphate Series									
13	...	30	30	..	.	...	...	924·1	+ 26·1
14	...	30	30	40	...	...	...	951·3	+ 53·3
15	...	30	30	60	...	...	. .	895·7	− 2·3
16	...	30	30	80	...	...	...	916·0	+ 18·0
17	...	...	...	40	...	...	...	869·5	− 28·5
18	...	30	30	40*	...	...	...	869·0	− 29·0
19	...	30	30	60*	...	...	...	832·3	− 65·7
Potash Series									
20	...	30	...	40	...	...	...	866·7	− 31·3
21	...	30	20	40	...	...	...	795·8	− 102·2
22	...	30	30	40	...	...	...	951·3	+ 53·3
23	...	30	40	40	...	...	...	838·8	− 59·2
24	...	...	40	...	...	...	..	860·1	− 37·9
Cotton Seed Meal Series									
25	...	...	...	...	3,000	...	...	876·3	− 21·7
26	...	...	...	..	600	...	...	876·6	− 21·4
27	...	..	30	...	300	...	...	876·3	− 21·7
28	...	...	...	40	300	...	...	933·1	+ 35·1
29	...	...	30	40	300	...	...	836·3	− 61·7
30	...	30	30	40	300	...	...	839·1	− 58·9

* Phosphoric acid as superphosphate.

In Table II, the means are given of experiments in this direction over a period of five years—the result of thirty-three individual experiments in St. Kitts, Montserrat and Antigua. In no instance is any appreciable increase traceable from the application of manures. These have now been repeated a considerable number of times under different conditions, and as a result, one can lay down with some confidence, that under the conditions obtaining in the Leeward Islands, with soils in moderately good tilth, the application of artificial and natural manures to Sea Island cotton is unremunerative. The fact must not be lost sight of, however, that the use of manure is not merely to benefit a particular crop of a certain year, but to maintain the agricultural value of the soil of the estate, as well. In deciding, therefore, what policy shall be followed, in any instance, in the matter of manuring, this latter important fact must be allowed for, in the consideration of the above results.

THE RAINFALL OF NEVIS AND ANTIGUA.

BY A. H. KIRBY, B. A. (Cantab.),

Scientific Assistant on the Staff of the Imperial Department of Agriculture.

In the following article an inquiry is made into the rainfall in Antigua and Nevis. This has been done chiefly on account of a suggestion, put forward in connexion with Nevis, that the rainfall of that island is diminishing. The statistics in relation to Antigua are discussed at the same time, in order that information may be obtained as to whether, if such a diminution is taking place, the conditions to which it owes its existence are merely local or more general.

The records of which use has been made are confined to those of the stations where figures are available for several years, and where the rain guage has remained in the same position during the whole of the time. Even then, blanks occur in the series, and the records containing these have been omitted from the compilation, or have had allowance made for them.

The tables that are used in the consideration of the matter have been constructed in two ways. In one, the means for five years of the averages of all stations during those years have been worked out, together with the general mean for the whole period (Tables A 1 and A 2).

According to the other method, the means for seven years, for each station, for every month of the year are given, together with the means, in the same way, for the whole period under consideration. In this case, in addition, the mean rainfall during the last seven-year period has been compared, on the basis of a percentage, with the average of the periods during the whole time under discussion (Tables B 1 and B 2) The purpose of the first method was to find if there has been a general diminution of rainfall during successive periods, and of the second, to discover, in the event of the existence of such

diminution, what particular seasons of the year, if any, have contributed to the general result. The consideration of these two phases of the question will be made in the order of the plan that has just been given.

The following table gives the average rainfall during five-year periods, as far as records are available, for several stations in Nevis, together with the means for five years of all stations, and the average of these. The results cannot be employed for forming any very particularized deductions, on account of the small number of records that have been made at some of the stations, as compared with the others. They ought to show in a general way, however, if any gradual decrease in the rainfall is taking place. Excluding the mean of the three-year period 1876-8, it is seen that the mean rainfall for each *lustrum*, reckoning back from 1908, is within the limits of 44·41 inches to 56·75 inches. Taking the figures in order, it is observed that there may have been, since 1883, two diminishing periods of rainfall, the first commencing with a high average in the period 1879-83, and the second with a high average in 1894-8. It is not intended to deduce the actual existence, from the figures, of such periods, for as has been stated, the final figures are obtained, during successive *lustra*, from differing numbers of stations. There is, however, nothing to show, in the figures for the general averages of stations, that a gradual diminution of the rainfall is taking place. When the figures of the stations themselves, for the last three periods, are considered, a gradual diminution during the time seems to be manifested, but this is no longer the case when periods anterior to those are compared. Unfortunately, in order that this may be done, dependence must be had on one station alone—Bush Hill—and the statistics that are available are insufficient for any conclusion to be formed in this way.

TABLE A 1. NEVIS. FIVE-YEAR PERIODS.

Estate.	1876-8.	1879-83.	1884-8.	1889-93.	1894-8	1899-1903.	1904-8.
Bush Hill ...	60·90	56·75	47·98	41·77	50·09	45·10	44·23
Pinneys ...	...	...	...	47·92	56·38	47·37	44·83
Cane Garden	...	...	...	49·04	56·25	51·90	46·88
Round Hill	...	...	...	...	60·85	53·07	48·24
Maddens ...	...	...	...	...	..	44·83	35·48
Old Manor...	...	...	...	...	...	...	44·2
Farm ...	...	..	...	...	...	..	46·77
Means of all Stations*	60·90†	56·75	47·98	46·34	56·15	48·31	44·41

*Average 52·16. †For three years.

Assistance in the matter may be gained by consulting Table B 1 which, however, as has been explained, was constructed for a different purpose. Here, the figures are given for each month of the year, and for seven-year periods, in the case of each estate for which two periods at least could be compiled. Taking the periods, where records for more than two are available, in the order of their occurrence, we find: Bush Hill: 50·37, 43·18, 48·94, 43·95 inches: Cane Garden: 51·89 54·34, 48·34 inches: Pinney: 50·21, 52·24, 45·54 inches There is no gradual lessening in the magnitude of the figures that would indicate a diminishing rainfall.

The next suggestion that arises is that the tables should be consulted in order to discover if they agree in presenting any interesting positive fact in relation to the rainfall. When this is done, it is almost immediately rendered evident that the rainfall of Nevis has been less during the last few years, up to the end of 1908. The fact is especially well brought forward in Table B 1, in the case of all stations.

Another reference to the tables will show that the occurrence of such a period of low rainfall is not abnormal, and that there is no reason to apprehend that the conditions which have given rise to it are of a permanent nature. Table A 1 shows that similar circumstances prevailed at a time which fell about the period 1884 to 1893, and this fact is upheld by the figures for 1888-94 in Table B 1, in the case of every station. It would appear, then, that this latest period of low rainfall is only one of a constantly recurring series. The records do not go back sufficiently far to give evidence as to whether this recurrence takes place at regular intervals.

The following table (A 2) gives the five-year means, as far as they are available, for Antigua: these will be shortly treated, in the way that has been employed for the records from Nevis. Here again, there is no evidence of a gradual diminution in the rainfall throughout a number of years, nor does it exist in the figures given for seven-year periods (Table B 2). Both the tables also lead to the same additional conclusions as were arrived at in the case of Nevis, namely: (1) that the rainfall has been smaller during the last few years (to 1908); and (2) that a similar state of affairs existed during a period falling between the years 1884-93. In the latter connexion, it seems significant that the inference may be drawn from the figures for six out of the seven stations at which they were available, for seven-year periods, those for Betty's Hope forming the exception. It is of further interest to record that the same facts are supported by the figures contained in a table, not given here, in which are presented the averages for quinquennial periods for all stations in Antigua.

TABLE A 2. ANTIGUA. FIVE-YEAR PERIODS.

Estate.	1888-93.	1894-8.	1899-1903.	1904-8.
North Sound	...	50·30	46·67	43 17
Betty's Hope	45·58	43·32	43·02	43·38
The Garden	...	...	50·30	.
The Cotton	...	41·69	40·01	34·70
Green Castle	52·66	57·51	54·35	45·98
Montpelier	...	42·61	43·32	35·83
Bendals	53·08	55·79	50·98	42·60
The Diamond	50·97	52·70	...	47·76
Pares	...	...	46·19	43·48
Cochranes	...	...	42·82	...
Means of all Stations*	50 57	49·13	46·41	42·11
Means : Complete records ..	50·44	52·21	49 45	43 99

*Average 47·05.

This conformity in the conclusions, in the matters treated, that may be drawn from a consideration of the rainfall records of Nevis and Antigua bears out the supposition that the precipitation in these two islands is, for periods of years, regulated in its quantity by the same natural conditions. It may be further supposed that this is true of a larger area than the one which includes those islands; records to support this are not, however, to hand at present.

As no gradual diminution in rainfall has been proved to exist, it is naturally impossible to discuss what part the precipitation during the different months of the year may have had in producing that result. There are, however, other interesting questions which merit consideration, and an account of these will now be given.

The fact of the existence of a recent period, during which a noticeably smaller precipitation has taken place, having been proved, it remains to find out what part the different portions of the year have had in contributing to the general result. As has been stated, tables have been constructed which show the means for seven years, for each station, for every month of the year, together with the means, in the same way, for the whole period under consideration; while, in addition, the mean rainfall during the last seven-year period has been compared, on the basis of a percentage, with the average of the periods

during the whole time under discussion. The table containing the statistics for Nevis, on these bases, follows. In dealing with the results, the last column has been consulted in order to find, for each month, the number of estates on which the rainfall during the last period has been above, equal to, or near (within 5 per cent. of) the average for the whole period for which figures are given. In two months, May and December, this has been the case at the maximum number of stations—five. March and September are next in order, with four; the numbers for the other months are insignificant. Apart from theoretical considerations, the conclusion that is of practical value* can be immediately deduced: that, during a period of diminished rainfall, in Nevis, the months that can be depended upon to give their quota of the normal supply are March, May, September and December, while it is the lessened rainfall of the other months that contributes to the general result.

TABLE B 1. NEVIS. SEVEN-YEAR PERIODS.

BUSH HILL.

Month.	Seven-year averages.				Average of periods.	Percentage (1902-8) below average of periods.
	1902-8.	1895-1901.	1888-94.	1881-87.		
January	2·38	3·35	2·61	3·44	2·95	19
February	1 60	1·94	1·82	2·39	1·94	18
March	2·70	2·02	1·42	2·20	2·08	(above)
April	1·89	1·48	3·07	2·99	2·36	20
May	4·54	3·22	3·02	3·60	3·59	(above)
June	4·24	4·18	4·50	4·03	4·24	(equal)
July	2·71	5·67	4·06	4·43	4·22	36
August	3·88	4·34	4·39	6·07	4·67	17
September ...	6·29	7·21	4·99	6·17	6·16	(above)
October	3·38	4·90	5·01	4·38	4·42	1
November	5·25	7·24	5·39	7·04	6·23	16
December	5·08	3·38	2·77	3·60	3·71	(above)
Average year ...	43·95	48·94	43·18	50·37	46·61	6

* This may have a distinct bearing on the advisability of the early planting of cotton—a procedure that is desirable on general grounds. [A. H. K.]

CANE GARDEN.

Month.	Seven-year averages.			Average of periods.	Percentage (1902-8) below average of periods.
	1902-8.	1895-1901.	1888-1894.		
January ...	2·76	3·23	3·27	3·09	11
February ...	2·08	2·26	2·44	2·26	8
March ...	3·00	2·03	1·88	2·30	(above)
April ...	2·06	1·73	3·99	2·60	21
May	4·73	3·88	3·72	4·11	(above)
June	4·54	4·81	5·50	4·95	8
July	3·24	6·63	4·72	4·86	33
August ...	4·37	4·81	5·18	4·79	9
September ...	7·38	8·02	5·72	7·04	(above)
October ...	4·03	5·16	6·20	5·13	21
November ...	5·41	8·48	6·02	6·64	19
December ..	4·73	3·29	3·31	3·78	(above)
Average year	48·34	54·34	51·89	51·53	7

MADDENS.

Month.	Seven-year averages.		Average of periods.	Percentage (1902-8) below average of periods.
	1902-8.	1895-1901.		
January	1·96	3·59	2·77	29
February	1·06	2·09	1·57	32
March	1·66	1·95	1·81	8
April	1·77	2·20	1·99	11
May	4·44	4·45	4·44	(equal
June	3·10	4·46	3·77	18
July	2·66	4·63	3·65	27
August	3·10	4·72	3·91	21
September ...	6·29	8·49	7·39	15
October	4·49	4·86	4·67	4
November ...	4·35	7·69	6·02	28
December ...	3·28	3·25	3·26	(above)
Average year ..	39·45	52·39	45·20	13

PINNEYS.

Month.	Seven-year averages. 1902-8.	1895-1901.	1888-1894.	Average of periods.	Percentage (1902-8) below average of periods.
January ...	2·53	2·83	3·15	2·84	11
February ...	1·78	1·85	2·63	2·09	15
March ...	2·79	1·98	1·75	2·17	(above)
April	1·99	2·17	3·68	2·61	24
May	4·02	3·06	3·49	3·53	(above)
June	4·12	5·00	5·36	4·83	15
July	3·12	5·79	4·92	4·61	32
August ...	4·10	4·90	5·22	4·74	14
September ...	6·99	7·36	5·28	6·54	(above)
October ...	4·43	6·05	5·85	5·44	19
November ...	4·83	7·79	5·69	6·11	21
December ...	4·97	3·45	3·29	3·91	(above)
Average year	45·54	52·24	50·21	49·33	8

ROUND HILL.

Month.	Seven-year averages. 1902-8.	1895-1901.	Average of periods.	Percentage (1902-8) below average of periods.
January	2·27	2·82	2·55	11
February	1·17	1·44	1·31	11
March	3·52	2·49	3·00	(above)
April	2·80	1·82	2·31	(above
May	4·79	4·81	4·80	(equal)
June	4·95	5·19	5·07	·2
July	3·16	6·05	4·60	31
August	4·48	4·84	4·66	4
September ...	8·28	8·93	8·61	4
October	4·76	6·19	5·48	13
November ...	5·17	9·17	7·17	28
December ...	5·35	3·37	4·36	(above)
Average year ...	50·71	57·13	53·91	6

The following table contains the results, similarly, for Antigua. The same method as that which has been employed for dealing with those of Nevis shows that the most dependable months for rainfall during a series of dry years are March, April, September, November and December. The three last-mentioned months have almost reached, or passed, the normal rainfall at the maximum number of stations—seven; April at six; and March at five.

TABLE B 2.—ANTIGUA. SEVEN-YEAR PERIODS. NORTH SOUND.

Month.	Seven-year averages.			Average of periods*	Percentage (1902-8) below average of periods.
	1902-8.	1895-01.	1888-94*		
January ...	2·25	2·66	2·73	2·53	11
February ...	1·18	1·27	1·74	1·38	15
March ...	1·92	2·02	1·51	1·83	(above)
April... ...	3·01	1·36	4·14	2·77	(above)
May	2·73	4·77	4·37	3·94	31
June	3·40	3·03	4·13	3·49	3
July	3·02	5·62	3·48	4·07	26
August ...	4·66	4·71	4·25	4·56	(above)
September ...	7·86	6·63	6·08	6·89	(above)
October ..	4·51	6·63	6·53	5·86	23
November ...	6·27	6·79	3 82	5·72	(above)
December ...	5·07	3·76	3·49	4·14	(above)
Average year	45·88	48·53	46·27	46·92	2

* 1891 missing.

BETTY'S HOPE.

Month.	Seven-year averages.			Average of periods.	Percentage (1902-8) below average of periods.
	1902-8.	1895-1901.	1888-94.		
January ...	2·18	2·71	2·91	2·63	·16
February ...	1·36	1·07	1·96	1·46	6
March ...	1·56	1·58	1·40	1·51	(above)
April... ...	3·18	0·98	3·77	2·64	(above)
May	3·23	4·17	2·77	3·39	4
June	2·91	2·87	4·04	3·26	10
July	3·10	5·10	4·79	4·33	28
August ...	4·60	4·32	3·90	4·27	(above)
September ..	7·17	5·83	5·69	6·23	(above)
October ...	4·61	5·17	5·37	5·05	8
November ...	6·13	5·68	3·96	5·25	(above)
December ...	4·22	3·45	3·65	3·77	(above)
Average year	44·25	43·03	44·21	43·83	(above)

THE COTTON.

Month.	Seven-year averages.			Average of periods*	Percentage (1902-8) below average of periods.
	1902-8.	1895-1901.	1888-94*		
January ...	1·26	2·10	2·49	1·92	34
February ...	0·74	0·98	1·87	1·16	36
March ...	1·37	2·25	1·19	1·62	15
April... ...	2·16	1·22	4·18	2·43	11
May	2·96	3·62	3·18	3·25	9
June	2·62	2·98	3·73	3·08	15
July	2·34	4·03	2·64	3·02	23
August ..	3·63	4·33	3·96	3·98	9
September ...	6·09	5·75	5·26	5·72	(above)
October ...	4·03	4·90	4·89	4·63	11
November ...	5·84	5·63	2·80	4·88	(above)
December ...	3·73	3·11	3·60	3·47	(above)
Average year	36·86	41·01	39·39	39·09	6

1891 missing.

GREEN CASTLE.

Month.	Seven-year averages.			Average of periods.	Percentage (1902-8) below average of periods.
	1902-8.	1895-1901.	1888-94.		
January ...	2·41	3·39	3·00	2·93	18
February ...	1·32	1·49	2·13	1·62	19
March ...	2·37	2·22	2·21	2·27	(above)
April... ...	3·69	1·62	3·42	2·89	(above)
May	3·52	3·98	3·53	3·68	4
June	4·45	3·88	5·32	4·51	1
July	3·22	6·94	4·73	4·97	35
August ...	4·13	5·66	3·95	4·61	10
September ...	8·45	8·04	7·02	7·88	(above)
October ...	3·80	6·07	6·56	5·42	30
November ...	6·75	8·34	5·57	6·95	3
December ...	5·40	4·64	4·56	4·88	(above)
Average year	49·51	56·28	53·66	52·62	6

MONTPELIER.

Month.	Seven-year averages.			Average of periods.	Percentage (1902-8) below average of periods.
	1902-8.	1895-19 1.	1888-94.		
January ...	1·95	2·72	2·36	2·34	13
February ...	1·10	1·27	1·38	1·25	15
March ...	1·72	1·75	1·40	1·58	(above)
April... ...	2·75	1·03	2·99	2·26	(above)
May	2·92	3·56	2·36	2·95	1
June	2·54	3·68	3·98	3·40	34
July	2·22	5·97	4·62	4·27	48
August ...	3·94	4·48	3·38	3·93	(equal)
September ...	5·90	6·09	5·06	5·68	(above)
October ...	3·76	5·94	3·75	4·48	19
November ...	5·65	5·85	2·69	4·73	(above)
December ...	3·66	3·68	3·35	3·56	(above)
Average year	38·12	44·59	37·64	40·12	5

BENDALS.

Month.	Seven-year averages.			Average of periods.	Percentage (1902-8) below average of periods.
	1902-8.	1895-1901.	1888-94		
January ...	2·21	3·34	3·15	2·90	24
February ...	1·20	1·54	2·64	1·79	33
March ...	2·04	2·36	2·57	2·33	12
April... ...	3·15	1·64	3·56	2·79	(above)
May	3·21	3·75	3·74	3·57	10
June	4·05	3·39	5·37	4·27	5
July	3·15	6·81	4·97	4·97	37
August ...	4·01	5·32	4·66	4·66	14
September ...	7·22	7·73	6·33	7·15	(above)
October ...	3·82	6·31	6·69	5·61	32
November ...	6·57	7·64	5·07	6·43	(above)
December ...	4·83	4·78	4·07	4·56	(above)
Average year	45·51	54·60	52·84	50·98	11

THE DIAMOND.

Month.	Seven-year averages.			Average of periods*	Percentage (1902-8) below average of periods.
	1902-8.	1895-1900 *	1883-94.		
January ...	2·35	3·12	3·36	2·94	20
February ...	1·34	1·67	2·21	1·74	23
March ...	1·98	2·46	1·58	1·98	(equal)
April... ...	3·69	1·85	3·48	3·00	(above)
May	3·55	5·61	3·48	4·14	14
June	3·39	3·51	4·67	3·82	11
July	3·28	6·82	5·19	5·00	34
August ...	4·84	5·52	4·48	4·92	2
September ..	8·00	7·42	6·14	7·21	(above)
October ...	4·29	5·26	6·02	5·19	17
November ...	6·68	6·94	4·93	6·14	(above)
December ...	5·12	4·06	3·90	4·23	(above)
Average year	48·44	54·22	48·82	50·31	4

*1901 missing.

A comparison of the results for Nevis with those of Antigua shows that, although the months during which an approach to the normal rainfall may be expected, in a series of dry years, are not quite the same in the different islands, yet the conditions are similar if the question is considered from the point of view of periods of the year. Thus, a reference to the tables, and to what has just been said, shows that the rainfall of both islands is least likely to decrease at the equinoxes, and at the end of the year. Thus, the slight disparity in the matter of months is probably due to the fact of taking the results over short periods of the year, so that the effect of local conditions is allowed to show itself.

The conclusions that have been reached may be summarized as follows:—

(1) That the rainfall of Antigua and Nevis is not gradually diminishing.

(2) That the precipitation has been smaller than the normal amount, in both islands, during the last few years.

(3) That periods during which this takes place recur at intervals, the last one having been in or near the years 1884-93, so that the condition is not abnormal.

(4) That the general conclusion may be drawn, from the three foregoing statements, that there are periods of years of diminished rainfall, over large areas, that are intermittent in their occurrence. There is no evidence to show whether these happen regularly or not.

(5) That, for both islands, during a period of years in which the rainfall is deficient, the times at which the precipitation may be relied upon to be nearest to the normal amount occur at or near the equinoxes and at the end of the year.

(6) That, on the contrary, during such a period, the months whose rainfall suffers the greatest diminution are those which are most remote from the equinoxes, with the exception of those that immediately precede the close of the year. This, in effect, means that a period of diminished rainfall owes its existence mainly to abnormally small precipitation during the beginning and middle of the year. This does not preclude the possibility of assistance being given, in attaining the general result, by the fact that the rainfall of the other months has remained near the average for several years.

(7) That all the above considerations help to indicate that the conditions which regulate changes in the rainfall for periods of several years have a wide area of operation.

COURSES OF READING AND EXAMINATIONS IN PRACTICAL AGRICULTURE.

In connexion with the Courses of Reading and Examinations in Practical Agriculture, instituted by the Imperial Department of Agriculture for the West Indies, three examinations have already been held. These consisted of examinations in the Preliminary stage, conducted on February 13 and 15, and October 11, 1909; and one in the Intermediate stage, on November 1 and 2, 1909.

At the first Preliminary Examination, fourteen candidates presented themselves. Of these, two passed in the first class, four in the second, and three in the third class, while five failed to satisfy the examiners. In the second Preliminary Examination, there were twenty candidates, of whom five passed in the first class, the same number in the second and third classes, and five failed. Twelve candidates took the only Intermediate Examination that has been held so far, when the certificates gained were as follows: first class, five; second class, three; and third class, two. The remaining two candidates will be required to pass satisfactory examinations in certain parts of the syllabus before the certificate can be granted to them.

It is interesting to note that the number of islands in which the first Preliminary Examination was held was two—Antigua, and St. Kitts while, in the second, it had extended to seven: these were Antigua, Barbados, Dominica, Grenada, St. Kitts, St. Lucia, and St. Vincent. The Intermediate Examination was held in six islands—those in the list just given, with the exception of St. Vincent.

The experience that has been gained, in organizing and conducting the examinations, has led to the adoption of several modifications of the original scheme, though it remains the same in its general aspect. One of these changes has been to arrange for the holding of yearly, instead of half-yearly, examinations. Another is in the direction of making additions, to some extent, to the syllabus of the Reading Courses. As a result of this, a leaflet (No. 1, New Series, February, 1910.) has recently been issued by the Department for the purpose of presenting the syllabus as it now stands, after modification. As the matter is of general interest, and for purposes of record, the substance of this leaflet is reproduced here.

READING COURSES AND EXAMINATIONS IN PRACTICAL AGRICULTURE.

Reading Courses have been established, under the direction of the Imperial Department of Agriculture, for the purpose of enabling overseers on estates, and others engaged in the practice of Agriculture, to acquire, from reading, knowledge that they can apply in connexion with their practical work.

Examinations will be held periodically at various centres in the West Indies, at which times, persons who have previous-

ly been registered as students in the Reading Courses may become candidates.

Examinations will be held during October and November each year. There are three examinations in the series:—Preliminary, Intermediate and Final. Each examination consists of two parts, written and oral. The oral part is intended to bring out the candidate's knowledge in its practical application to his work and, in the Intermediate and Final Examinations, this part will be conducted by representative planters at each centre, who may from time to time be willing to assist the Department in this service.

The Preliminary Examination requires a general all-round knowledge and education, such as might be expected of an intelligent young man about to begin his career in the planting profession. Candidates who have passed the Cambridge Senior Local Examination in Agricultural Science, or the Examinations in Agricultural Science at Harrison College, Barbados, or who are in possession of any other certificate which may be deemed by the Imperial Commissioner of Agriculture to be an equivalent, will be excused from taking the Preliminary Examination.

The Intermediate Examination is of a standard to require such knowledge of planting work and the general principles of Agriculture as might be expected of an intelligent overseer of a few years' experience.

The Final Examination requires such knowledge as might be expected from a man capable of being entrusted with the management of an estate.

Persons who wish to take the examinations must be registered as students in the Reading Courses outlined by the Imperial Department of Agriculture, and the examinations must be taken in the order named.

Registration in the Reading Courses and the payment of the fee entitle students to certain publications of the Imperial Department of Agriculture, which are recommended for reading; students are also entitled to sit for the examinations, provided they give notice of their intention to do so in the manner required. Notices will be sent out to all the students in the Reading Courses prior to each examination, with forms to be filled in, signed and returned, on which students may signify their intention to sit for certain examinations.

For all information required in regard to Reading Courses and Examinations, application should be made to the Senior Officer of the local Department of Agriculture in each island.

Candidates who are successful in passing the prescribed examinations will be awarded certificates by the Imperial Commissioner of Agriculture. It is intended that the possession of the three certificates, Preliminary, Intermediate and Final, or in the special circumstances cited above, of the Intermediate and Final, shall be a guarantee of a sound general knowledge of the fundamental principles underlying the practice of Agriculture, and also of a practical knowledge of at least two crops, and their products, such as Sugar, Cacao

Cotton, Limes, Rice and Bananas. Provision Crops, including Sweet Potatos, Yams, Corn, Eddos, and the like, may be allowed by arrangement to take the place in these examinations of one of the principal crops in those districts where only one principal crop is usually grown.

SYLLABUS.

Reading Courses Preparatory to the Preliminary Examination.

An elementary knowledge of the following subjects and topics will be expected from candidates in the Preliminary Examination :—

The atmosphere and the gases composing it. Water and its properties. The chemical and physical properties of sand, clay, chalk and humus. The classification of soils. The functions of plant food and water. Drainage of soil. The construction and use of one form of plough, of subsoiler, and of cultivator. Tillage and its effects. The preparation and properties and chief constituents of farmyard manure. The properties and uses of the common artificial manures and of lime. Green dressings and organic manures. Micro-organisms in soil and in relation to leguminous plants.

Seeds : their structure and germination. The naked-eye structure, and the outlines of the microscopic structure of the root, stem, leaf, flower and fruit of a plant.

Assimilation, transpiration, and respiration in plants. Plant food. The absorption and movement of water in plants.

The propagation of plants by cuttings, by grafting and by budding. Pollination and fertilization. Structure and Functions of Farm Animals.

The following references indicate the reading which will furnish the required information in regard to the foregoing points :—

Fream's *Elements of Agriculture*, pp. 1-110 and 334-86.
Duggar's *Agriculture for Southern Schools.*
Cousins, *Chemistry of the Garden.*
Nature Teaching. (I.D.A.)
Lectures to Sugar Planters, lectures 1-4. (I.D.A.)

Reading Courses Preparatory to the Intermediate Examination.

A more thorough knowledge of the general subjects given under the previous heading will be required in the Intermediate Examination and, in addition, the candidate must be familiar with fungoid diseases and insect pests of agricultural crops.

The general characters of fungi. Fungoid diseases on plants. General treatment of fungoid diseases.

General life-history of insects. The principal orders of insects. The relation of insects to plants. The general treatment of insect pests.

Fream's *Elements of Agriculture*, pp. 312-33.

Fletcher's *Soils*.

Lectures to Sugar Planters. (I.D.A.)

PAMPHLETS.

No 5, 'General Treatment of Insect Pests'.
" 7, 'Scale Insects of the Lesser Antilles', Part I.
" 22, 'Scale Insects of the Lesser Antilles', Part II.
" 17, 'General Treatment of Fungoid Pests.'
" 29, 'Lectures on Diseases of the Sugar-cane.'

WEST INDIAN BULLETIN.

Root Disease of the Sugar-cane, by F. A. Stockdale, B.A., F.L.S.

Insect Pests affecting Sugar-cane, by H. A. Ballou, B.Sc.

In addition, students should read the articles in the *Agricultural News* on the Orders of Insects, in Vols. VI and VII; the series on the Natural History of Insects in Vol. VIII, and those entitled 'Fungus Notes'.

CROP SUBJECTS.

In addition to the general agriculture on the lines indicated above, two crop subjects must be prepared for the Intermediate Examination. The selection of the crops to be taken will be optional, but they must be crops with which the candidate has had practical experience.

SUGAR-CANE CULTIVATION. The preparation and care of the soil, planting, manuring, tending and reaping the crop. The principal varieties of sugar-cane and their characteristics. The principal fungoid diseases and insect pests of the sugar-cane and the methods of controlling them.

SUGAR MANUFACTURE, MODERN FACTORY METHODS. Students who elect to be examined in this branch will be expected to be familiar with the general principles underlying the factory method of sugar manufacture, such as structure and the working of the triple effect, the vacuum pan, and the process of maceration, etc.

SUGAR MANUFACTURE, MUSCOVADO METHOD. A good knowledge of the general principles in this branch will be expected of students who sit for it. This will include a knowledge of tempering lime juice, boiling sugar, etc., etc., the use of tayches, and steam-heated pans.

RUM MANUFACTURE. In this branch, students for the examination will be expected to have some knowledge of the processes of fermentation and distillation, the life-history of yeasts, the structure of stills, etc.

Noel Deerr's *Sugar and the Sugar-cane.*

Watts's *Introductory Manual for Sugar-Growers.*

Lectures to Sugar Planters. (I.D.A.)

West Indian Bulletin. Papers relating to the sugar industry.

Pamphlets dealing with Experiments with Sugar-canes in Barbados and the Leeward Islands.

Annual Reports of the Botanic and Experiment Stations.

Candidates who take the examination on the Sugar Industry may be passed if successful in the first part—Sugar-cane Cultivation: but they may, if they so choose, take any of the other parts under this heading. They will be allowed to take, *in addition* to Sugar-cane Cultivation, either Sugar Manufacture, Factory Methods, or Sugar Manufacture, Muscovado Method, or Rum Manufacture: but will not be allowed to take two of them at one examination, except that the parts relating to Muscovado Sugar and Rum may be taken if so desired.

The subject in which the candidate is successful in passing will be mentioned on the certificate.

COTTON. Preparation of the soil; planting and tending the growing crops. A knowledge of the principal insects and fungoid pests of cotton and the means used in controlling them. Picking cotton. The selection of cotton seed and its preparation for sowing. An elementary knowledge of the qualities of cotton lint and the manner of ascertaining them. The uses of cotton seed.

Pamphlet No. 45, 'A B C of Cotton Planting.'

Pamphlet No. 60, 'Cotton Gins.'

West Indian Bulletin.

Annual Reports of the Botanic and Experiment Stations.

LIMES. The planting and tending of lime orchards. The chief pests attacking limes, and the methods of controlling them. Gathering the crop. Crushing the fruit. The methods of dealing with lime juice. The preparation of concentrated juice and citrate of lime. The preparation of essential oil of limes. The preparation and packing of lime fruit for shipment.

Pamphlet No. 53, 'A B C of Lime Cultivation.'

Botanic Station Reports.

West Indian Bulletin.

CACAO. The planting and tending of cacao orchards. The chief pests attacking cacao, and the methods of controlling them. The gathering of the crop. The fermentation and preparation of the cacao beans for market.

Hart's *Cacao.*

Wright's *Cacao, its Botany, Cultivation, Chemistry and Diseases.*

Pamphlet No. 58, 'Insect Pests of Cacao.'

Pamphlet No. 61, 'The Grafting of Cacao.'

Reports on the Experiments with Cacao at Dominica and Grenada.

BANANAS. The planting and tending of banana fields. The chief pests attacking bananas and the methods of controlling them. The gathering, handling, packing and shipping of the fruit.

'The Banana Industry in Jamaica', *West Indian Bulletin,* Vol. III, No. 2.

RICE. Cultivation and preparation.

'Rice-Growing in British Guiana', *West Indian Bulletin,* Vol. II, No. 4.

PROVISION CROPS.

Nicholls' *Tropical Agriculture.* Those portions dealing with Maize, Guinea corn, Cassava, Arrowroot, Yam, Potato, Tania.

Final Examination.

The principles of agriculture as set out in the syllabus for Preliminary and Intermediate examinations, treated more fully, and including :—

The origin, formation and composition of soils. The biology of soils. The implements, methods and effects of tillage. Manures and manuring. Farmyard manures. Green dressings. Liming, etc. Rotation of crops. Hay-making. Ensilage. Improvement of plants by artificial selection and hybridization. The management and care of farm animals. Special crops: any two of those mentioned in the intermediate syllabus, but treated more fully.

Candidates must show an accurate knowledge of estate book-keeping, of the cost of performing various operations in husbandry, together with a knowledge of the principal facts governing estate expenditure. They must be familiar with the management of labourers, with the apportionment of, and payment for, work done. They will be required to answer questions concerning the general fundamental principles of estate management, including the management of land, simple

land mensuration, crops, labourers, and farm animals, and to show an elementary knowledge concerning the management and care of buildings and implements generally.

Candidates will be expected to be familiar with, and capable of critically examining, the work and results of the local Experiment Stations and the reports and papers emanating therefrom.

Reading :—

All books previously mentioned.

Hall. *The Soil.*

„ *Fertilizers and Manures.*

Lipman. *Bacteria in Relation to Country Life.*

King. *Physics of Agriculture.*

General List of Books Recommended for Use in Connexion with These Courses.

[It is not expected that any student should procure *all* the books listed. A careful choice should be made of those books likely to be of greatest value to the individual student. In making this choice, the assistance of the Officers of the local Department of Agriculture should be sought.]

'Elements of Agriculture', by W. Fream (Published by Murray), 2*s.* 6*d.*

'Catechism of Agricultural Chemistry', by Johnson (Published by Blackwood & Sons), 1*s.*

'Chemistry of the Garden', by H. H. Cousins (Published by Macmillan), 1*s.*

The Soil', by A. D. Hall (Published by J. Murray), 3*s.* 6*d.*

'Nature Teaching', Imperial Department of Agriculture, 2*s.* 6*d.*

Lectures to Sugar Planters', Imperial Department of Agriculture, 1*s.*

'Sugar and the Sugar-cane', by Noel Deerr (Published by N. Rodger, Altrincham, Manchester), 7*s.* 6*d.*

'Introductory Manual for Sugar-Growers', by Dr. F. Watts (Published by Longman's, Green & Co.).

'Cacao', by J. H. Hart (Published by Davidson & Todd, Trinidad), 3*s.*

'Cacao, its Botany, Cultivation, Chemistry, and Diseases', by Herbert Wright (Published by Ferguson, Colombo and London), 7*s.* 6*d.*

'Tropical Agriculture', by Dr. H. A. A. Nicholls (Published by Macmillan), 6*s.*

'Agriculture for Southern Schools', by Duggar (Published by Macmillan), 4*s.*

'Southern Agriculture', by Earle (Published by Macmillan).

'Principles of Plant Culture', by Goff (Published by Author).

'Fertilizers and Manures', by Hall (Published by John Murray), 5*s.*

'Soils ', by Fletcher (Published by Constable).

'Cane Sugar and its Manufacture', by H. C. P. Geerligs (Published by Norman Rodger).

'Bacteria in Relation to Country Life', by Lipman (Published by Macmillan).

'Physics of Agriculture', by King.

Publications of the Imperial Department of Agriculture :—

PAMPHLETS.

No. 5, 'General Treatment of Insect Pests', 4*d*.
No. 7, 'Scale Insects of the Lesser Antilles', Part I, 4*d*.
No. 22, " " Part II, 4*d*.
No. 17, 'General Treatment of Fungoid Pests', 4*d*.
No. 29, 'Lectures on the Diseases of the Sugar-cane', 4*d*.
No. 45, 'A B C of Cotton Planting', 6*d*.
No. 53, 'A B C of Lime Cultivation', 4*d*.
No. 54, 'Fungus diseases of Cacao and Sanitation of Cacao Orchards', 4*d*.
No. 58, 'Insect Pests of Cacao', 4*d*.
No. 61, 'Grafting of Cacao', 4*d*.

Candidates can also obtain very useful information from publications of the Imperial Department of Agriculture other than those specially mentioned in the above list. It is recommended that the *Agricultural News*, the *West Indian Bulletin*, together with Reports on local Experiment Stations and pamphlets, should be regularly consulted.

WEST INDIAN BULLETIN.

The Flower-bud Maggot of Cotton, by H A. Ballou, Vol. IX, p. 1.
Scarabee of the Sweet Potato, by H. A Ballou. Vol. X, p. 180.
Treatment of Cotton Pests in the West Indies, by H. A. Ballou, Vol. IX, p. 235.
Root Disease of the Sugar-cane, by F. A. Stockdale, Vol. IX, p. 103.
Insect Pests affecting Sugar-cane, by H. A. Ballou. Vol VI, p. 37.
Fungus Diseases of Cotton, by L. Lewton-Brain, Vol. VI, p. 117.

AGRICULTURAL NEWS.

Natural History of Insects.' 'Orders of Insects.'
Articles on the Life-History of the Fungi', Vol. VIII, Nos. 190–2.

BOTANIC AND EXPERIMENT STATION REPORTS.

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